Innovation

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Viareggio, 14 April 2012

Introduction

Over the years, I have repeated *ad nauseum* that the way I choose a topic every year for the next lecture is simply to hold up a finger to the wind and try to sense what is all the rage at the moment. And, as you can see, this year it turned out to be "innovation." Why innovation? A couple of reasons come to mind:

- 2011 was the year in which the death of a public figure brought about an outpouring of mass grief (some say hysteria) around the world at a level that had not been seen since the death of Princess Diana. When Steve Jobs died, people everywhere were talking about the way his innovations had touched their lives in the most personal way.
- The great economic crisis in the Eurozone started in 2011 (and continues today – the Italian Stock Exchange lost nearly 6 percent this week). The day after I communicated to Lucia the chosen topic last December, there was a headline in the local newspaper that "Only Innovation Can Save Italy." The word "innovation" is on everybody's lips right now as the chief means of creating the growth that is needed to exit from the crisis.

Whatever the reasons, there is no question that innovation is in the air nowadays – in the newspapers, on television talk shows, on the Internet. The *Washington Post* has created an entire section named *Innovations*. Companies are creating innovation departments. Cities are competing to attract vibrant new startups to their technological innovation campuses.

Innovative companies are in the spotlight – Apple being the most prominent example, of course. But also companies that have failed due to *lack* of innovation are in the spotlight. The current poster child for innovation failure is Kodak, which recently [19 January 2012] filed for bankruptcy protection. Article after article is analyzing why they didn't catch the wave of digital photography, while mourning the passing of the company that nearly singlehandedly brought photography to the masses. (I was one of the millions of young people whose first camera was a Kodak Brownie. When the original Brownie camera was introduced in 1900 it cost one dollar, and a roll of film cost fifteen cents.)

So, given that we are all obsessed with innovation at the moment, it seemed appropriate to take a closer look. Now, innovation is a topic of enormous scope, and a lot is being

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invested in the pursuit of innovation all over the world right now. We can't possibly expect to cover absolutely every aspect of innovation in this lecture, and frankly, you would probably be very, very bored by the kind of talk you hear in industrial or economic circles. So I've decided to narrow the focus today to some specific aspects of innovation that I think we'll all find more interesting – the human aspects, or what we might think of as the "psychology of innovation."

Are we all innovators?

The very first question I'd like to consider together with you is very simple: Who can innovate? Are innovators people with some kind of special, magical talent? That's the traditional point of view, and one that is still held by many. Or is that point of view perhaps wrong? Maybe *anybody* can innovate. Maybe we are *all* potential innovators – it just has to be somehow "drawn out of us". This is a point of view that many companies are in fact counting on right now. They have started "innovation initiatives," whereby all employees are encouraged to come up with their own ideas for innovation and propose them to top management.

In my role as an associate editor of a computer software journal a couple of years ago, I personally handled the review of an article submitted by a company that proudly described its innovation initiative in great detail. It was open to all employees in the company, from the highest to the lowest. It provided for employees to be rewarded in various ways for their successful ideas, including the possibility to participate in the implementation of their idea as a new business venture undertaken by the company. It was all very exciting, and although I didn't have the chance to track the company's subsequent success in that initiative, it certainly seemed like a wonderful way to promote the idea that "we are all innovators."

And yet: Nicholas Carr (whom I have already introduced in a previous talk as the gadfly thorn in the side of information technologists everywhere with his remorselessly iconoclastic pronouncements on some of our most cherished beliefs) has a different story to tell. In his book *Building Bridges*, he describes a company that introduced just such an "innovation initiative", but whose subsequent experience was anything but exciting. It turned out that the most talented people in the company considered the initiative to be a kind of silly publicity stunt, a distraction, and in general a waste of time, and essentially ignored it. Conversely, the *least* talented people in the company considered the initiative to be a great way to relieve the boredom of their normal jobs and embraced the initiative with great enthusiasm, coming forward with idea after idea – all this while ignoring their normal duties within the company, of course. The problem was that the ideas of these less talented employees (as might be expected) were terrible, and nothing good ever came out of the initiative.

So which will it be? Are we all innovators or not? Well, it just might be that we are not quite looking at it in the right way. Maybe the right question is a slightly different one. And the best explanation I have seen yet was in a movie about a dead cook and a rat.

The wrong question?

As far as I'm concerned, the animated film *Ratatouille* of Pixar (owned by Steve Jobs, by the way) is not just one of the best cartoons around, but one of the best films, period. I wasn't surprised at all when a *New York Times* article reported that this was the first time that people were openly wondering whether it was allowed by the rules to select a cartoon for the Oscar at the Academy Awards in the category of "Best Picture." (I was so enthusiastic about the film that I forced a food-loving Welsh couple to sit through it one evening at my house – only to discover that she had a rat phobia and was miserable the entire time. After that I let people decide for themselves whether they wanted to see it.)

Although many aspects of the plot were complicated, the main idea was simple enough: a recently demised Parisian cook named Chef Gusteau had written a famous book with the title *Anybody Can Cook* that inspired many, including a rat from the provinces. The rat turned out to have an enormous culinary talent and ended up cooking a meal for the famous and feared Parisian food critic named Ego.

Ego was absolutely floored by the meal, and even more so when he found out that it had been cooked by a lowly rat. The next day his review appeared in the newspaper, and among many other things, he had this to say:

> In the past, I have made no secret of my disdain for Chef Gusteau's famous motto "Anyone Can Cook." But I realize, only now do I truly understand what he meant: not everyone can become a great artist – but a great artist can come from anywhere.

So, following Chef Gusteau and Ego, we are *not* all innovators. But at the same time, there is no telling *who* among us might turn out to be the great innovators.

The Most Beautiful Woman in the World

A startling illustration of this principle was provided in a book published just last year [2011]. One of the most famous stars of the golden age of film was Hedy Lamarr (who died only a few years ago, in 2000). She was known in her heyday as the Most Beautiful Woman in the World, and also had the distinction of being in the first nude scene in a studio motion picture (if you're interested, the film was called *Ecstasy* and was made in Czechoslovakia).

Another figure in the golden age of film was George Antheil, who, from the late 1930s onwards, was a much sought-after composer of music for films, including those starring top-echelon actors such as Humphrey Bogart. (In addition, he himself vaguely resembled the actor James Cagney.) But he was much more than just a "film composer." He was an *avant-garde* composer who was good enough to convince musicians of the caliber of Igor Stravinsky to befriend and support him. He moved easily in the milieu of the Lost Generation and even lived for a while in the apartment above Silvia Beach's legendary bookstore Shakespeare and Company in Paris, where he hobnobbed with writers such as Ezra Pound. His roguish behavior (like putting a pistol on top of the piano when he performed) got him the reputation of being a kind of "bad

boy of music" (which he then chose as the title of his 1945 autobiography), and he was beside himself with delight when a riot broke out during the Paris debut of his music, evoking comparisons to the riot that had greeted the premiere of Stravinksy's *The Rite of Spring* many years earlier in Paris. One of his most bizarre compositions was called *Ballet Mécanique*, whose list of instruments included sixteen synchronized player pianos, a siren, and an airplane propeller.

Now, after this description, I'm quite sure that the last thing that comes to mind when you think of either Hedy Lamarr or George Antheil is "innovation," at least in the sense that we have been talking about. I suppose you could think of Hedy Lamarr's pioneering nude scene in a studio film as an innovation of sorts; and George Antheil did write some avant-garde music that might deserve the label "innovative". But surely, you say, we are far away from the kind of *technical* innovation that is the subject of this talk, aren't we? The kind that Steve Jobs and Apple are famous for? Well, it turns out that you are dead wrong. In one of the most extraordinary partnerships in the history of science, Hedy Lamarr and George Antheil became the co-inventors of a technology that is the basis for much of modern communications.

In addition to being a composer, Antheil also published a crime novel (whose protagonist was based on Ezra Pound). He was a successful and insightful reporter and critic for a music journal. And he even wrote a nationally syndicated advice column in the style of "Ask Ann Landers" and "Dear Abby." This is how he eventually met Hedy Lamarr, who originally sought him out in order to find out more about his pet theories on women's endocrinology that he had been promoting.

This was early in World War II, and they shared an interest in helping to defeat the Nazis. Hedy Lamarr's first husband (she ended up marrying six times altogether) had been an Austrian arms manufacturer, and she had learned a lot from him – and she also turned out to have significant mathematical talent. George Antheil brought in the experience he had gained from synchronizing player pianos in his *Ballet Mécanique*. They put their heads together and came up with a way to make it hard for the enemy to interfere with radio-guided torpedoes. The idea was as clever as it was simple: hop around from frequency to frequency so quickly that the enemy didn't have enough time with each frequency to identify it and jam it. (It all had to be synchronized, of course, or the "good guys" wouldn't find the frequency either – that's where Antheil's contribution came in.)

They were granted US Patent 2,292,387 for their invention that eventually became known as *frequency hopping*. This lay the groundwork for what became *spread spectrum technology*, which underlies communications technologies we all use today such as Bluetooth and WiFi.

As *Ratatouille*'s Ego said: you just never know where the new and innovative might come from.

Who are the innovators?

But this still doesn't address an important question: *what kind of person* is most likely to be an innovator? This has been the subject of a lot of interest, of course – there is nothing that companies would more like to be able to do than discover ways to "find the great innovators." I'd like to return now to the person I started this talk with: Steve Jobs. He was a charismatic, extroverted person who could singlehandedly mesmerize his audiences, setting up his famous "reality distortion field" and convincing people of pretty much anything. His presentations at the annual MacWorld conference in San Francisco were legendary.

But as Susan Cain, the author of a recent [March 2012] book entitled *Quiet: The Power of Introverts in a World That Can't Stop Talking* points out, the innovation that got Apple started – the Apple II computer – was not invented by the extroverted Jobs, but rather by his very *introverted* friend and colleague Steve Wozniak.

Cain writes that introverts are getting a raw deal in society today, to everybody's detriment. As much as half of the population is made up of introverts, and yet our society tends to pay a lot more attention to extroverts (a bit like the situation of women half a century ago, when their talents were being wasted by a society that ignored their potential).

One of the ways in which extroverts are favored by today's society is the tendency to promote doing things in groups. For example, one of the most popular techniques for stimulating innovation is "brainstorming." Get a bunch of people in the room and let them bounce ideas off each other. The more people involved, the better; the more interaction, the better. There are a lot of variations on this theme. In my work, there is an approach to computer software development that has gained much favor over the last decade, called "extreme programming." One of the tenets of this approach is that everybody should be physically together in one big shared space, where everybody can interact all the time. Lots of meetings together, no "compartmentalized knowledge," everybody knows everything.

In fact, some have gone as far as to say that group work is the wave of the future in *all* innovation. In an article in the *Washington Post* [3 February 2012], Neal Gabler wrote:

> In our global, networked economy, the lone wolf is rapidly becoming an anachronism, one that threatens to impede innovation rather than fostering it … while the idea of individual agency may have great appeal, innovation is increasingly coming from groups, not solitary heroes. Capitalism as a communal enterprise — dare we call it collective capitalism? — is the new engine of innovation …

But although Susan Cain isn't against collaboration as such, she *is* leading a campaign against "groupthink." And the reason has to do with something we already talked about two years ago in my talk on the Crowd. Recall that I said that it turns out that a crowd is only truly effective when its members are *independent* from each other. Cain emphasizes this fact even more. It is well-known that in group situations people unconsciously tend to take on the opinions of others in the group, and usually very quickly. It can last very little time before the entire group has taken on the position of

the dominant or most charismatic person (who is often the most extroverted person), whether or not that person is right.

Quite the contrary to the extroverted ambience of "groupthink," Cain notes that the kind of ambience that promotes independent, creative, innovative thinking has a much more introverted flavor:

> Studies suggest that many of the most creative people are introverts, and this is partly because of their capacity for quiet. Introverts are careful, reflective thinkers who can tolerate the solitude that idea-generation requires.

Steve Wozniak said that he never would have learned the skills that eventually allowed him to create the first Apple computer if he hadn't been too introverted to leave the house when he was young. As Cain notes, Wozniak has written the following advice in his memoir:

> Most inventors and engineers I've met are like me ... they live in their heads. They're almost like artists. In fact, the very best of them *are* artists. And artists work best alone ... I'm going to give you some advice that might be hard to take. That advice is: Work alone ... Not on a committee. Not on a team.

Introverts aren't just important in *producing* innovation, they are important in the *promotion* of innovation in others. But there is a bias against introverts in leadership positions. There is generally an idea in society that extroverts are those most suited to leadership positions, and they are the ones who are most often groomed for leadership. While extroverts can certainly be great leaders, it is not universally true that they must be better leaders than introverts, and in fact the psychological characteristics of extroverts may actually *stifle* innovation in those whom they are leading. When an innovative idea is proposed by someone under his leadership, an extrovert may get so excited that he will take the idea and put his own stamp on it, effectively corrupting and possibly stifling the idea; whereas an introvert would be more likely to let the innovator run with his idea and allow it to come to fruition.

Cain's advice: get in touch with your inner introvert and take the time to carve out some solitude for yourself. You might just find that you will become more innovative.

Can we recognize innovation when we see it?

We've been spending time on the question "What kind of person can be an innovator?" and have suggested that introverts may be a neglected human resource in that respect. But now I'd like to spend a few minutes on a slightly different question: "What kind of person can *recognize* innovation when he sees it?"

Before you start thinking that recognizing innovation is easy, and anyone can do it – after all, think of the mad rush to buy the latest iPhone – let's take a look at a few counterexamples, kindly suggested to me by our club member Anthony Kirk:

- "Radio has no future." – *Lord Kelvin, Northern Irish mathematician and physicist, former president of the Royal Society, 1897.*

- "The Americans have need of the telephone, but we do not. We have plenty of messenger boys." – *Sir William Preece, chief engineer of the British Post Office, 1876.*
- "The cinema is little more than a fad. It's canned drama. What audiences really want to see is flesh and blood on the stage." – *Charlie Chaplin, actor, producer, director, and studio founder, 1916.*
- "Television won't last because people will soon get tired of staring at a plywood box every night." – *Darryl Zanuck, movie producer, 20th Century Fox, 1946.*
- "The Internet? We are not interested in it." – *Bill Gates, 1993.*
- "But what ... is it good for?" – *Engineer at the Advanced Computing Systems Division of IBM, 1968, commenting on the microchip.*

And just in case you think it applies only to technological innovation, one last example:

- "A cookie store is a bad idea. Besides, the market research reports say America likes crispy cookies, not soft and chewy cookies like you make" – *Response to Debbi Fields' idea of starting Mrs. Fields Cookies*.

Now, these were not stupid people. We could even say they were many of our our best and brightest minds. So it can't be a problem of intelligence. But if it isn't intelligence, then what *is* it that makes it so hard for us to judge innovation well? It turns out that a lot of it has to do (once again) with our own psychological makeup – and it doesn't matter whether you are Albert Einstein or Alfred E. Newman, it's inside *all* of us.

Consider this quote from Daniel Kahneman's 2011 book *Thinking, Fast and Slow*:

> "She's raving about an innovation that has large benefits and no costs. I suspect the **affect heuristic**."

What is he talking about? What is the "affect heuristic"? Kahneman is talking about some research carried out by Paul Slovic, in which he came to realize that the way people judge things (including innovations) is inextricably linked with their emotional reactions to it. It's a case of what is known as "substitution": instead of answering the hard question, which is "What do I *think* about this innovation?" people end up substituting an easier question, which is "How do I *feel* about this innovation?" Furthermore, once they have answered the question of how they feel about it, they make their lives even easier by driving their reactions to the extreme: the innovation either is the most wonderful thing in the world or the worst thing in the world. Why? Because this reaction keeps us from having to make hard choices between benefits and drawbacks. None of us can escape this phenomenon. Even poor Mr. H.M. Warner (as in "Warner Brothers Films"), who in 1927 said "Who the hell wants to hear actors talk?" wasn't immune to the affect heuristic. It's just our human nature.

The Innovator's Dilemma

It's bad enough when people fail to recognize the innovation made by others, but it gets worse: they're also perfectly capable of failing to realize the value of their *own* innovation.

One of the most clamorous business events in the last few months [19 January 2012] has been the bankruptcy of Kodak, which I mentioned at the beginning of this talk. I also mentioned that they failed to "catch the wave of digital photography". But what I didn't mention was that *Kodak itself* developed the digital camera! That's right: in 1975, one of Kodak's own engineers (Steven Sasson) built the first digital camera. So why didn't Kodak see the great innovation that they held right in their own hands, the innovation that would revolutionize the world of photography?

Today we know that they were victims of the so-called *Innovator's Dilemma*, as described in the now-classic book with the same title written by Professor Clayton Christensen of Harvard University. In that book, Christenson explained that successful companies (like Kodak) are mostly concerned with constant improvement in their successful products, because that's what their customers are asking for and are willing to pay for. Their customers want *sustaining innovation* in the products they are buying, such as ever higher-quality film. It turns out that digital photography was something that Christensen characterized with the now famous name *disruptive innovation*. Disruptive innovation offers an entirely new way to do things (like photography without film).

So where is the "dilemma" mentioned in the book's title? The dilemma is that when it arrives, disruptive innovation almost never has a market. When Kodak invented the digital camera, its customers couldn't have cared less. Their cameras used *film*. What were they going to do, throw them away? For what? A new camera that, by the way, produced pictures of much lower quality than film-based cameras? (That's still true to a large extent today – so you can imagine how it was in 1975.) So a company generally has no motivation to pursue a disruptive innovation; on the contrary, it would be irresponsible toward its loyal customers to do so. Psychologically, they and their customers are blinded to the potential of the new technology. This phenomenon has occurred countless times, where prosperous, well-managed companies are brought to their knees by disruptive innovation that sometimes they themselves had invented, but did not pursue.

Another classic example of disruptive innovation is word processing. I remember the early days of word processing when my father's law office had a huge, powerful, expensive Wang word processing system that all the secretaries used (my father used an old Underwood manual typewriter to write his own documents). That Wang system was the premier choice for word processing and it was hugely successful for years. Meanwhile, I had bought the very first portable computer, the Osborne 1. It had a two-inch square screen, and I wrote my documents using a rather primitive program called WordStar. The quality was far, far inferior to that of the Wang processing system. But it was disruptive. I was what later became known as an "early adopter" of this new way of doing word processing using general-purpose computers rather than specialized machines – and, as I write these words today using Microsoft Word on my laptop computer, I think I can safely say that it was the disruptive innovation that won out in the end.

The Role of Luck

It turns out that one of our biggest problems in dealing with innovation can be traced back to yet another one of our great psychological failings, something else that is inside every one of us: our insistence on finding a causal explanation for everything, even when there is none. Daniel Kahneman recounts how everybody talks about the amazing success of Google, a company that was able to innovate continuously and never made a single wrong move on the way to greatness. He points out that people talk about the Google story as though it was *inevitable*. But there was no inevitability; at every turn there was also a healthy dose of good fortune (such as a missing counter-move by some competitor). Kahneman puts it this way: Success = Talent + Luck. And Great Success = More Talent + a Lot More Luck. Rationally, we might "know" this. But intuitively we continue to try to find an explanation for everything. Kahneman illustrates the core problem with this statement:

> Very intelligent women tend to marry less intelligent men.

Now, this is not a joke, it is a documented fact (indeed, my wife has observed this in our own marriage a number of times). Ask people why this might be so, and you will receive any number of explanations, such as "Intelligent women are the dominating type and like to choose a man they can control," and so forth.

But in reality there is no causal explanation. It is a mere statistical fact that is an expression of the phenomenon of *regression to the mean*. You might remember this concept from my lecture two years ago on the Crowd, when I mentioned that it was discovered by Francis Galton, one of the great minds of the 19th century. Regression to the mean tells us that one extraordinary event is always more likely to be followed by a less extraordinary one, statistically speaking. It works both ways, too, of course: very intelligent men tend to marry less intelligent women (although my wife never seems to buy that part of the argument, for some reason).

In other words: sometimes an innovation is successful not because its inventor was introvert or extrovert, thin or fat, tall or small … but simply because he was lucky. Or, as the 17th century moralist Francois, duc de La Rochefoucauld said:

> Although men flatter themselves with their great actions, they are not so often the result of a great design as of chance.

Conclusion?

So what is our conclusion about what kind of person is best suited to be an innovator? This brings me right back, once again and for the last time, to the person with whom we started the talk: Steve Jobs. In an article written for the *Harvard Business Review*, Walter Isaacson, the writer of the biography that you now see everywhere, from the local bookstore to the *Autogrill* rest stop on the highway from Florence to Rome, wrote the following about Jobs:

> He connected the humanities to the sciences, creativity to technology, arts to engineering. There were greater technologists (Wozniak, Gates), and certainly better designers and artists. But no one

> else in our era could better [connect] poetry and processors in a way that jolted innovation … The creativity that can occur when a feel for both the humanities and the sciences exists in one strong personality was what most interested me in my biographies of [Benjamin] Franklin and [Albert] Einstein, and I believe that it will be a key to building innovative economies in the 21st century. It is the essence of applied imagination, and it's why both the humanities and the sciences are critical for any society that is to have a creative edge in the future.

I don't know how true that quote will turn out to be, but I like it a lot. And I'm not the only one who agrees with it. I am one of the editors of a magazine called *Uncommon Culture*, which was founded by a group of scholars in European library science who are heavily involved in the initiative to digitize the artifacts of European culture. The latest issue of the magazine contains a Foreword by the Vice President of the European Commission, who suggests that "*cultural material can contribute to innovation… and become the driver of new development*."

And I think this attitude represents well what we're trying to do right here at the Club. We have talks on everything from poetry, theater, and art to history, science, and technology. Who knows, maybe we're incubating some of the next great innovators right here in this lecture hall.

Resources

Richard Rhodes, *Hedy's Folly: The Life and Breakthrough Inventions of Hedy Lamarr, the Most Beautiful Woman in the World*, 2011.

Walter Isaacson, *Steve Jobs*, 2011.

Daniel Kahneman, *Thinking, Fast and Slow*, 2011.

Nicholas Carr, *Building Bridges: Essays on Business, Technology and Innovation*, 2011.

Susan Cain, *Quiet: The Power of Introverts in a World That Can't Stop Talking*, 2012.

Clayton Christensen, *The Innovator's Dilemma*, 2003.