A Major Disruption In Scientific Research

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On July 21 of this year, newspapers all over the country showed pictures from the previous day of President Obama with the Apollo 11 crew—Neil Armstrong, Buzz Aldrin and Michael Collins. They were celebrating the 40th anniversary of Apollo 11 landing on the moon.

I certainly remember the day of the Apollo 11 landing, and everyone here older than about 45 probably remembers it clearly also. It was a great day for our country and a great day for science. It helped spark the interest in training and developing scientists. An analogous period had been the tremendous scientific effort which went into the development of the atomic bomb during World War II. Those two disruptive surges in science and the related excitement encouraged at least two generations of young people to become scientists. And these scientific surges led to a tremendous amount of growth in the U.S. and throughout the world. I would argue that they formed the basis for much of the economic growth during the 20th century.

There has been no comparable period in recent years to create similar excitement, and other countries have been gaining on the U.S. relative to the development of scientists. I hear a lot of discussion about this, and it definitely is an area for concern.

And there are other trends relative to scientific research. One of these, which I think is extremely important, is that major companies support far less research than they did only a few years ago. The reported research budgets of giant companies may appear to be as large as in past years, but, with closer look, one will see that a far greater percentage is directed at the development of existing products or business areas, as opposed to research to seek new opportunities. More and more, large companies are losing their capabilities to be real innovators and to create new business areas.

This was not true when I received my Ph.D. in 1963 and moved into my first job in research. In fact, I was fortunate enough to be involved personally in the development of multiple new products and the development of entirely new business directions during my career, all of which was with large, well established companies.

But, now, large companies have reduced their true research efforts, have discouraged meaningful innovation, certainly discouraged disruptive innovation, and, instead, look for much of their growth from the acquisition of companies created by entrepreneurs. I think this is a problem, but my concern about it is not likely to change what is being done. The trend is too strong, and the reasons for it are too strong.

But, at the same time, this creates a tremendous opportunity for aggressive entrepreneurs. No one should get confused that opportunity always equates to success, but certainly the opportunity exists for entrepreneurs to develop new businesses and compete with existing major companies or to be acquired by those companies.

Looking at just the last 40 years or so, I want to ask you to think about two industries: those of electronics and pharmaceuticals. First, for electronics, let's assume you had been asked this question during the late 1960s. "If computer capability, the Internet and related information technology were to become available, what companies might be the leaders in these new fields?" If I had been asked this, I would have listed the companies which were then in areas which seemed to be related. And most of my choices would have been wrong. Most of the leaders in the broad electronics industry did not even exist in the 1960s.

And, in the pharmaceutical industry, companies are having less and less success at developing major new drugs. They sometimes openly admit that they are not able to think broadly enough, that they are limited by their own experience. Some pharmaceutical companies have even announced that their strategy for growth is to acquire companies which have developed new drugs. The companies which are acquired, of course, are companies which were started by entrepreneurs, people who were able to think outside the normal guidelines. I formed a company to develop new routes for therapeutics, and we are having encouraging results thus far.

Even if we had chosen the steel industry for our focus, you would have to think hard to find a major steel company that existed 40 years ago. And these industries are not isolated examples.

There are reasons that many once great companies falter over time and are replaced by others. First, no one should overlook inept leadership as a reason for failure or weakness of a company. That is, in fact, a pretty common reason and it does not take long for poor leadership to mess up a company.

But I want to look past inept leadership for the moment and look instead at why even well managed companies often miss emerging markets and fail to adjust until it is too late, why they have no interest in research in these areas and why so many companies fail to recognize disruptive innovation until it is too late and their company is at a serious disadvantage.

There is an absolutely great book that was published a few years ago entitled, The Innovator's Dilemma, with a very interesting sub-title, When New Technologies Cause Great Firms to Fail. The author, Clayton Christensen, takes what initially sounds like a radical position when he indicates that great companies often fail because they do most things right. That, at first thought, seems ridiculous. Great companies often fail because they do most things right.

Christensen goes on to demonstrate why outstanding companies that understood their markets well, listened to their customers, and invested in emerging technologies related to their existing businesses still lost their market leadership when confronted with disruptive changes in technology.

Christensen argues that what we would probably all categorize as good business practice can cause a company to falter and even to fail. He says that such companies focus investments and technology on their most profitable products that are currently in high demand, and that this ultimately can weaken a great company.

Christensen says that truly great innovations, disruptive technologies, are initially rejected by mainstream customers because they can not currently use them. This rejection can lead well-managed companies to ignore these areas and to allow strategically important innovations to be ignored. And that can allow new companies to be built and to displace the established company.

This is a frightening analysis, but I am convinced that he is absolutely correct.

And, if this does not keep creative people in major companies from working on disruptive innovations, there are other techniques which will generally work. Only a few years into my career, I was working with a person from another department within our company on a joint project, a person who out-ranked me by a few notches. I described an idea to him for a project. As soon as I finished, he gave an immediate response, "I'm glad you brought that up Bob so that I could hear it and forget it."

And, not long after that, I went into my supervisor's office and told him I wanted to give him an update on the projects my group was working on. Again, the response was immediate, "Bob, I'd rather you not review your work with me. That way I can't be held responsible."

I can not keep from adding that, despite those comments, my group came up with 2 major developments during that period.

These were not isolated events in my career. I could have listed 20 more. I will mention one more from 1985 when Lyondell Petrochemical had just been formed as a division of Atlantic Richfield. Lyondell was composed entirely of businesses which were losing money. I thought we could improve, and, in fact, Lyondell became profitable within 9 months and stayed profitable for the next 11 years while I was CEO. But, in 1985 in the early days, it was pretty dicey. My new boss, who had previously been responsible for a major portion of what was now Lyondell, asked me, "Bob, how do you think you are going to improve these businesses? Do you think we have been trying to lose money?"

My point is this. Major companies are not good at disruptive innovation and certainly not good at creating a culture of creativity. I pretty much ignored such comments during my career, although you can tell I did not totally ignore them because I still remember them vividly. I have often told people working with me that if we are bothered by

such comments, we are doomed to fail. Only the people with sufficient confidence to ignore such things will succeed in new business areas.

But the bottom line is that business in our country has been changing for several years. For the most part, large companies have neither the desire nor the capability to be truly innovative. They no longer have the capability to do meaningful research. And they do not have the culture to take risks in new business areas. They often take ridiculous risks in other matters but not with new business direction. We have just witnessed some of the irresponsible risk taken by many companies which led to the recent economic crisis in the U.S. and the world. And now, as the country talks about new business areas for the future, we are often told that this is too risky.

But, if major companies can not be relied upon for developing the disruptive technology of the future, for developing new business directions, then it creates tremendous opportunity for entrepreneurs and for university research. The opportunity for entrepreneurs has been clear for awhile, and that is why there are so many venture capital groups. But I don't think the opportunity for university research has been nearly so clear.

So what does this mean for Southern Illinois University? In my thinking, it is a major opportunity. Let me just outline this simply.

1. The best researchers in the country are located at universities and medical centers. This was not true during much of my career, but it definitely is true now. SIU certainly has its share of good researchers. I know most of the staff in the Chemistry Department and have personally observed their capabilities. And I know that other science departments also have strong researchers.
2. The best entrepreneurs in the country are independent business people who look a lot like people in this audience. They generally don't have great amounts of money but they make up for it with drive and desire.
3. Innovations in the future will increasingly come from entrepreneurs and universities working together.
4. The advantage in this area is not necessarily with the major research universities. They have the advantage of size, but they also have too much bureaucracy, far too many arbitrary rules, and far too much arrogance. They can be difficult and even insulting to work with. Even entrepreneurs can have a sensitive side and eventually be bothered by insults and arrogance.
5. So there is a major opportunity for a university with excellent research capability but which has not yet developed all the arrogance of a major research university. This is a tremendous opportunity for Southern Illinois University.

There is no question in my mind that this is a major disruption which is now developing. I also know that taking advantage of it is not totally straight-forward. But the universities and researchers who can best adjust have an excellent opportunity.

And what we are doing today is an important step toward this. You are going to hear from some excellent researchers, hear about some great business opportunities and hear about some successes with emerging businesses.

It is a very important step that several key people at SIU have been moving in this direction and have developed today's program to showcase the activity. And I am very pleased to be here as part of that.

Lightly edited for readability.