

## **Innovation and Entrepreneurship**

Remarks by Dr. Millard S. Firebaugh, ME Professor of Practice, University of Maryland  
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Being of an engineering mind, if there is a spec, I like to know what it is. I don't always adhere, but I've found that it is good to know what it is, even if am going to depart from it. So, Avi's invitation to participate in this panel sent me to the Oxford English Dictionary so I could understand what we are intended to discuss... understand the spec. And, I got a small surprise. Now I have used these words a lot over the years. Indeed at General Dynamics, Electric Boat Corp. I had the title of VP Innovation. One would think that if nothing else, that qualifies me as an expert on the subject. What that meant at Electric Boat was that the Engineers and Designers worked for me, designing new submarines, including new technology in the process. In order to understand what the OED has to say about these two words, "Innovation and Entrepreneurship" I needed to learn about one more related word, "invention." An invention is, among several definitions "an original contrivance or device," usage from the mid 1500's. Also from the mid 1500s an innovation is "a novel practice or method." But, more recently the economist Schumpeter used the word in 1939 to mean, "the action of introducing a new product into the market." From the mid 1800's comes the meaning of the word entrepreneur, "the person who takes the risk of profit and loss."

What do we make of this? The invention is the thing. Innovation and Entrepreneurship are processes. I mention this in the company of engineering students at this kind of event to make a very specific point. Most of the effort of attaining an engineering degree goes into the challenging process of grasping the physics and the math and applying that knowledge to solving technical problems...doing those problem sets and lab experiments. But, innovation and entrepreneurship are all about getting a product to market and dealing with the risks of profit and loss...I imagine more the risk of loss than the risk of profit. Innovation and Entrepreneurship are not mainly about the engineering...they are about the business, about the deployment of capital to bring something new to the customers that comprise the market...about what people want or need. This is a big subject for a ten minute talk, so I am just going to advise on a few key points

If you have a nifty idea that turns into an invention that in your mind solves some awesome problem for the human race, you are going to have to make friends with folks who will fund your work and folks who will buy your product.

"Change" is a big topic these days, especially in the political campaigns. "Change", is a little broader word than "innovation." I guess I could make a point that Mr. Obama is a new product into the market...an innovation. Hard to say that about the other two folks.

But, innovation is really hard. Someone, once made the claim to me that an innovation had to make something like a 35% improvement in the state of affairs before it had a chance of displacing the established method or product. He called that the hurdle factor. I don't know where that metric came from, but I appreciate its relevance. Why does the "new" have to be a lot better than the "old" to displace the "old?" Because, the customer knows most of the issues and limitations of business as usual and has probably provided for them, somehow, in his plan. But, it is much harder to evaluate the situation relative to the "new" because there is no experience upon which to rely. Lots of estimates, extrapolations, and assessments must be made without much data and each is subject to errors and surprises. In marketing a technical innovation the entrepreneur who succeeds will probably have done a lot of work to understand how the potential customer is using the technology already in service and the implications of making the change to the new technology.

Innovation, as I have implied, often starts with an invention. The invention will usually be, in retrospect, just a crude approximation to the product that will eventually find a market. So, the inventor needs money to take the invention from its primitive state to one which is attractive to customers. The inventor needs help. Often the process starts with family and friends and home equity loans. Then with some positive results it can progress to angel investors...folks who are comfortable with long shots. Or the invention may point toward a solution to a problem that is a matter of interest to government or to an established corporation. These investors are usually making a number of such investments and are playing the odds, that though most will fail, one or two will succeed brilliantly.

The money must be used to improve the product and tell the story. It is hard to do both of these things at once, so often the inventor needs help from the entrepreneur. Communication is critically important...real communication involving dialogue. Demonstrations, working models and prototypes and a well laid out but simple story to tell are key. A lot of the early stage marketing is not to customers but to early stage investors. These folks want to own a share of your business and they are going to be very demanding. The story for them has a different focus from the marketing to customers.

Communicate, Communicate, Communicate! I have a case study ongoing at the moment. A small company, basically an inventor and an entrepreneur have a nifty design for a mechanical product. It is more efficient, simpler and presumably requires less maintenance than the products it seeks to displace. But, these folks are operating only at the extremes of what needs to be communicated. The inventor has written the full up dynamic and kinematic equations for the device and wants to engage in arcane discussion over fine points of analysis with the few colleagues that want to do that, none of whom have any money to put into the game. Of course the analytic basis for the device is very important but it may or may not be important to a particular communication. The entrepreneur in this case is so righteous about the virtues of the product and so much into rebuttal of criticism that he is not listening to customers. The presentation materials describe potential markets in terms of millions of units, but none have made it past the prototype stage. I fear that this potentially excellent idea may never attract customers or investors with real money for the failure to communicate artfully.

Assume that your audience either customer or investor or regulator or advisor is an intelligent person, maybe smarter than you. Assume that they know more about their business than you do. Create a simple step by step presentation of your ideas and products. Incidentally, just because you arrived at what you know by some tortured process, with dead-ends and recursions, does not mean you have to take the folks you are trying to sell to your conclusions by the same path. Work at presenting your story clearly from first principles, but efficiently and logically. And, listen carefully to every question. Learn from the questions and observations of your audience. Do not wing an answer. Your audience may know more than they reveal. Show data. Bring a model or the real thing if it will travel, or take the folks to your lab. Try to understand the background of the individuals you are addressing. Do your homework. A question for which you do not have an answer can be a good thing, because it allows you to respond by telling the individual that you will develop the answer and provide it by some point in the very near future. That gives you an opportunity to continue the dialog. Respect your investors and your customers. Communicate.

An early friend and an expensive one will be the patent attorney, but the inventor, innovator, entrepreneur needs to know that the patent is not something sacrosanct. As soon as it is granted, it is public. There will be imitators and even infringers and the fledgling company can become transfixed by the defense of its scanty IP rather than on the move to build or capture a market. But, keep those

engineering notebooks in order as your work proceeds, noting each new idea, each event, each plan and test with dates and who knew what when. So innovation starts with an invention, but that is just the beginning. Entrepreneurs can get overly focused on protecting IP. If the idea is a good one it will attract competition. You probably want that, because the fact that another group is after the same market gives your basic concept some additional validity. Your best protection is to work harder than the competition and stay ahead, rather than spending a lot of effort on looking in your rearview mirror plotting defenses. In the early stages it is important to investors that you have useful IP so I don't mean to imply that it is unimportant...just that it must be kept in perspective.

Both your investor and your customers are not really investing in your invention. They are investing in you, your ideas, your judgment, your work ethic. This applies to the inventor and the entrepreneur. Your integrity, competence, customer awareness and stamina are your main selling points.