

Venture Capital versus Nanotechnology

By Pearl Chin

VC firms seem to be doing more damage than good with regard to bringing important nanotechnology research and products to the public. At various conferences and networking events, it was quite clear that VC's were not interested in putting themselves out there for nanotechnology. One VC firm claimed they take a contrarian view: "If it's hot, it's not for them." Other VC firms have no clue what nanotechnology is and dismiss it as a fad without admitting they don't understand it.

Nanotechnology is not a fad. It is tangible technologies based on scientific principles on a nanoscale enabling great technological advances and applications across many industries.

At the moment, the VC's appear thankful they already have the expertise in-house to understand MEMS and biotech (also known as "Wet Nanotechnology" or more recently "Nano-Bio") areas of nanotechnology so they seem to be concentrating on exploring those ventures now, such as in medical devices. However MEMS doesn't really belong in nanotechnology as it is more on the micro or micron scale (10-6 meters) than on a nanometer scale.

The buzzword to encompass both MEMS and nanotechnological approaches is "molelectronics", a contraction of "molecular electronics." Nanotechnology research is already focusing now on ways to fabricate them using nanolithography and nanoscale self-assembling systems, and more recently the new LADI (Laser Assisted Direct Imprint) process. Self-assembling systems are also useful in proteomics (the study of proteins and their role in cell behavior to combat disease) to fabricate biochip sensors or "lab on a chip" for faster and more convenient disease detection. "Wet nanotechnology" or "Nano-Bio" is only a small part of nanotechnology. However investing in "wet nanotechnology" can be expensive and subject to the arduous FDA approval process.

Thus investing in nanotechnology only partially armed with expertise is not going to be able to take full advantage of the opportunities available. However most VC firms must first admit they don't understand nanotechnology in its entirety before they can start thinking this way. And there's no 12-step program for that yet. The VC firms should take a hard look at themselves and ask, "Are we really prepared to invest in this new and risky area of growth?"

After a crazy couple of years of "have business plan on napkin, will fund," VC's lost their shirts. One firm I spoke with lost close to 60% of its value in the last 3 years. I liken the situation as VC firms being stripped down to their underwear trying to find a job without being armed with a decent suit. They need the suit so they can go to other interviews and get more jobs. The expertise is the suit. However, they don't know what constitutes a good suit since the trends keep changing. It also helps to know what the job is for which you're interviewing. Here nanotechnology investment projects are the job for which they're interviewing. However you never know how long a trend will last so you have to at some point buckle down and just buy one, but not just any suit, but a good quality one, maybe just a designer or custom made suit. That usually means you have to shop around a bit and learn what constitutes a good quality suit and of course research the jobs for which you're interviewing.

Right now there's a lot of window shopping going on but no real buying or job research. However, you've got to buy the suit first before you can go to the interview. This means VC's must spend money on the expertise first, especially the technology expertise, either have it in-house or outsource it, as a long-term investment. A good suit that is a classic transcends the trends by definition and is an investment, lasting for years. Worn and taken care of appropriately, the suit will recoup its initial investment many times over. At some point, the window-shopping has to stop and the suit must be purchased.

There seems to be lots of great nanotechnology ideas but not much guidance or information on how to assess, scale-up for production, commercialize and market the technology. Even many scientists agree that one of the biggest challenges with nanotechnology is finding commercial applications for the scientific discoveries.

However, I reiterate, technical innovation has its own timetable. When the innovation happens you just have to be ready to jump on the opportunity when it presents itself. In the meantime, you have to be prepared when this happens so that you don't lose any time. This approach should be no different for nanotechnology. You'll win some and you'll lose some. However, at that early stage it's more like winning and losing in the casino at the slot machines versus at the high rollers table and also because you can no longer afford to play with the high rollers any more.

The point is, this all becomes much less risky the more you understand the technology, the product and its potential applications, and hence the market. Understanding lessens the risk thus knowledge is power. In other words, "What you don't know can hurt you." Moreover, the more you understand the whole process, the better you can guide a startup's management and influence public opinion and acceptance about your product. Public relations and marketing affects the rate at which the public adopts and accepts your product. This is typical from which to consider product life cycle for new product introductions, especially when it comes to disruptive technologies, technologies that can replace current technologies and ways of doing things.

However, hype is a very real concern for the VC's. How do we separate out the hype? With technical experts around, companies will be less likely to try to pull the wool over VC's eyes. Not only will they function as experts who can assess the technology, but they can also act as deterrents, like armed guards at the gate. Hiring people with expertise is probably the best way. The other way is to train those people you already have in that knowledge. It really depends on what expertise you're trying to obtain.

All knowledge is learnable - it just depends on what your time frame is. If you need someone who understands materials, sending someone for a Ph.D. or even a master's degree is probably too long a time frame. It's a lot easier to train someone how to fundraise than to train someone how to understand nanotechnology research. And if as a VC firm you could only hire one person, with nanotechnology being so broad, how do you find someone with the necessary breadth? I mean not just breadth in nanotechnology understanding, which is critical, but also breadth in business and management experience. Often a technology can be viable, but can it be viable in the time frame and with the returns on investment desirable for a VC firm? It might be very useful for those technical people to have an MBA and possibly have some operations management experience. It's always useful to have someone who can wear many hats in an organization.

Up until now, it sounds like it's all the VC's fault as to why nanotechnology isn't getting the VC funding push it needs. Such is the dilemma of VC's with aspiring nanotechnology entrepreneurs and research right now. Unfortunately, there is still that gap between VC's and the nanotechnology entrepreneurs. The nanotechnology research scientist turned entrepreneur has very little idea what the VC firms are interested in. The gap must be bridged otherwise good ideas may not get funded because the researcher doesn't know how to market the idea and himself and the VC's are holding onto their money until they feel more comfortable with nanotechnology. If you as an entrepreneur cannot present and explain your idea and why it has value and deserves money, then you should find the business expertise to help you do so. It's the same as writing funding proposals within academic research and it's no different here. It's just a different audience and the stakes are higher.

To bridge that gap there should be services available to help nanotechnology entrepreneurs approach venture capital, government funding, angel investors or other investment sources. A major management consulting firm was at the conference offering just such services. However, many startups are strapped for cash so it's rather difficult to engage such high profile professional services as it's often very expensive. However, many such large firms want to take an equity position in the company as compensation for such expert services. Now for some startups, this doesn't sit well and if you have issues about giving up control, then it's time to start looking at less expensive but no less valuable alternatives to get those types of services, such as through independent consultants. But where to find them?

In general, it is not easy to find someone who has a deep technical and broad nanotechnological background who can understand and manage the business side of technology. One must be able to tap into a network of technical people possibly with MBA degrees and with experience in startups, business

development, technology and market assessment, intellectual property expertise, management and operations, business plans etc. Large consulting firms have that expertise but you have to pay for and support all the other expertise they support that you don't need. But independent consultants don't have that overhead, often working from home or wherever since knowledge is portable and they can work anywhere as long as they don't have a problem with travel.

Or perhaps it can be that easy. The nearest business school usually has tons of students eager to try their hand at a business plan for practically nothing. If you want more experienced people, there are independent consulting networks that are starting to capitalize on their technical MBA offerings. There's always networking too. It's also possible to meet qualified people at VC networking events like youngStartup Ventures (www.youngstartup.com) and VentureSeek.

Why aren't VC's actively investing in nanotechnology?

So what is stopping the VC's from doing what they're supposed to be doing, which is investing their capital in risky ventures? It's fear...fear of losing more money again on hype. However risk is inherent in this business even though it often seems they have forgotten that. "You have to be in it to win it" but you have to understand it too. Otherwise it's always going to be hype to them no matter how useful it really is.

When the economy was riding high, the stock market bull seemed unstoppable. Unfortunately, when the economy took a downturn, that was when the wheat was separated from the chaff and the bear is trampling the chaff and chomping on the wheat. Like companies, the investments that are still afloat are the ones where there was a solid understanding of the business model and market due to proper due diligence or research, good management and VC advisement in place. Those are the ones that survived. All that talk about the Internet kickstarting a new economy was mostly hype and even the most respected analysts and economists jumped on the Internet bandwagon, afraid to look stupid just in case the hype was true because they didn't understand the Internet. Fundamentally, the Internet changed very little. The Internet was just new sales and marketing and distribution channels.

At the time, there was an awful lot of rationalization and objectivity was suspended out of just plain greed. It happens to the best of us. People lost most of their money on the Internet wave because they didn't understand it and they ignored the business fundamentals. It is much easier to blame the companies than to hold themselves just as accountable. Does that mean we should stop investing? No, it should mean we just have to be better at filtering out the hype.

With less money available, some VC firms are taking what they think is a more conservative approach to spending such as not spending now and waiting until after proof of concept stage, or late stage investing as they call it. One VC firm I spoke with was trying to decide whether it was better to get into nanotechnology investing now or in the R&D stages or wait on the sidelines to see if it's a proven technology. Here's where it's worth reminding that it is technologies and not technology.

If Thomas Edison or Alexander Graham Bell needed VC funding the way it's structured now, we'd never have the light bulb or the telephone. Of course, to be fair, they didn't have to deal with a kite or telegraph industry shakeout either. If VC's will take an informed risk, we all may have the next cure for cancer and products to minimize the effects of the aging process while never having to clean the toilet again. Of course, your boss could also argue that because of all these innovations, you might have more time to focus on work. There's always a downside to balance the upside. However, you also have the choice of whether to take advantage of new technology or not. For example, you can choose to have your cell phone on or off or whether or not to even have one. I'm sure you know plenty of people who refuse to carry one.

In Beth Mantz's May 1st, 2002 "Wall Street Journal" article about the state of venture capital spending for nanotechnology, she states the VC firms who are waiting are the ones who are more savvy. I disagree. I believe they are the ones who are less in the know and don't understand the science very well. Just because a startup has a proven pioneer with bringing many startups to public companies to doesn't mean the research or the management is more viable. Ms. Mantz mentions Larry Bock, CEO of Nanosys, as a

case in point. Upon closer examination, Mr. Bock's resume makes him perfect for a biotech or Nano-Bio startup. The problem is, Nanosys is a mainly materials and moletronics nanotechnology manufacturing startup whose products like quantum dots and nanowires also happen to be useful in chemical and biological nanosensors. It's like hiring former President Bill Clinton to lead Mexico because Mexico part of North America. Of course it could work but it seems to be a more difficult route.

The only reason to wait until after proof of concept is because understanding of the technology and the market is not there to begin with so proof of concept must be shown first. This happens to defeat the goal of balanced venture capital investing. However, it is also not really conservative spending if VC's wait until after proof of concept. At that point it then becomes more expensive to invest and there will be competition among VC firms to get into an opportunity that has a working prototype. Investment at that level is much higher than coming in at the earlier stages. However, if you are the main VC firm from the beginning, chances are you will stay and reap the benefits if you've done a good job up and until then. Unfortunately, if all the VC firms adopt this strategy, without adequate seed and early stage funding, even the best ideas won't even get off the ground to this later proof of concept stage. It's much riskier at the earlier stages but the initial investment is much lower too. There may be a longer time for return on investment but sometimes you can't rush or control success.

Forming alliances or partnering now with other VC firms is an option for lessening and diversifying risk. Some VC firms are doing just that already. At this point it's probably more prudent to collaborate to diversify risk this way to save time, energy and money instead of wasting it all fighting and beating one another to an opportunity since they're all after the same thing.

Collaboration and cooperation shouldn't just be words bandied about in business school classes and management journals. They're the best mantras since peace and free love during the sixties. Even Russell Crowe playing Professor John Nash, the father of Game Theory with his 1994 Nobel Prize in Economics for the Nash Equilibrium in the movie "A Beautiful Mind," tried to explain to his peers the advantages of a cooperative game strategy over a noncooperative one as a way to maximize their success at getting women. The idea is that you can maximize the outcome overall as a group versus as individuals so that everyone wins instead of everyone losing.

Since the pie is much smaller lately, the individual pieces of the pie are also proportionally smaller. Most people want bigger pieces or to grow what piece they have left. Two things can happen at this point. 1) To protect what little piece of the pie you have left, don't let more people in so that the pie doesn't get cut into smaller pieces for distribution or 2) Let others in to help grow the pie and subsequently slice the pie into more but relatively bigger pieces.

Right now, it seems Number 1 is happening even though Number 2 is the preferred route according to cooperative game strategy. However, Number 2 is always more difficult to do. To move into new markets, you have to grow your expertise in those markets and you have to invest in growing that expertise. Nanotechnology is a new market, perhaps an emerging market in some people's eyes even though nanotechnology has been around for a while under various guises and includes many different industries and applications. But there are people out there already who meet many of those qualifications as nanotechnology experts that VC's need.

In the course of my interactions with VC firms at various events, one VC firm said they couldn't hire anyone until they raised enough funding for their nanotechnology arm. Might not it be easier to raise the funding if you could first demonstrate to your investors you had the expertise, whether in-house or outsourced, to invest their money properly? VC firms place a lot of emphasis on hiring people with VC experience. I'm sure you've all experienced that Catch 22 at some point in your life. Even offers of free expertise or a less costly internship option were either politely declined or never taken up on. Several people I know who have nanotechnology with business backgrounds have had similar experiences. Doesn't turning down free expert services sound strange? One only does that if one believes the payout later is much more than they would like to give. Do they just not need the help?

All indications are that the VC people are extremely busy, overworked and constantly traveling. The only thing we know for sure is it's not about money initially if we're talking about free services. Are current

VC's afraid for their jobs or of others being able to later horn in on their action? If that's true, there seems to be much more "protecting of your piece of the pie" going on instead of "growing the pie". According to cooperative game theory, it's often better to expand the pie to create win-win business scenarios.

I spent the majority of the time with one VC firm trying to explain what was nanotechnology. Another VC firm claimed they wanted someone who had startup experience. Finding people with startup experience only makes sense if the VC firms are somehow ensuring the people who were in failed startups have actually learned from their mistakes instead of blaming their failure on timing or unsympathetic VC's when the funding ran out. Chances are, the people from startups now in the market are from startups that failed. Otherwise, they'd still be at the startup. It would make more sense for VC's to hire someone with operations or management consulting experience, people who know how management should be done and are counseling others to do just that. They would be better able to assess management of or help manage these startups.

Most major consulting firms tend to deal with larger companies. However, from my experience as a management consultant, scaling down of processes is much easier than scaling up. Unless they're looking for someone who is familiar with the stress of not meeting and not knowing how to meet VC milestone deadlines for continued funding, the operations management consultant who understands operations from a broad perspective might be the better choice.

In addition, it would be useful if there's someone who can interface between the VC's and the Research & Development (R&D) people to be able to manage expectations of meeting revenue targets and funding deadlines. Most researchers don't think like a VC (nor do they want to) nor do they think about costs and revenues too much. To cover the entire gamut, it might even be helpful to have someone that also has government research lab experience or at least understands how the government funding game is played in case the ball needs to be kicked back to them for further development. Throw in a little law experience too for understanding intellectual property rights for good measure. Instead of just a nanotechnology expert, you actually might need a jack-of-all-trades.

It would be more cost effective to have as many of these attributes in one person if VC's are going to go ahead and invest seriously in nanotechnology. Hiring individual experts in each area separately at this stage of the game becomes prohibitively costly while minimizing synergies. There is little guarantee on ROI but for sure there is for diminishing returns. There has to be a happy medium and an optimal mix of skill sets. At that point, the question becomes "Which skills can be easily taught in-house versus those that takes years of education or relevant experience? How do we try to find the best balance of skill sets with what we can afford or wish to pay?" However, it is like looking for a needle in a haystack. However, the needles are there and if you're persistent, you'll be able to find them. If you define what the needle or these people should look like it'll be much easier to find the needles, hence the right people.

Access to a key source of cutting edge nanotechnology research – the universities – can also be problematic. And if you know anything about dealing with academics, entry into that world is not easy. There are major trust issues between the academic world and the outside world. It becomes much easier if a PhD who is in their field or who understands their field can interface between them and the interested investment firms.

Hence, in order for venture capitalists to make highly profitable nanotechnology investments, they have to arm themselves with proper expertise and work together with nanotechnology researchers and entrepreneurs to achieve mutually beneficial goals. They must engage in cooperative game strategy.

It is clear from the above discussion that VC firms should not forget their business fundamentals when making nanotechnology investments. Understanding your technology and product, your customer and market and most importantly, making sure you have people who know how to do this well to filter out the hype before jumping into the nanotechnology fray, is critical for successful ventures. This will help you get what you and everyone else wants out of nanotechnology - optimizing your ROI. Even that is the goal of cooperative game strategy. Chances are VC's will have to wait several years for returns anyway, so you might as well take the time to do it right, thereby maximizing your returns.

At the moment, VC's don't have too much choice in investing in anything else new, hot and sexy on the horizon yet or more interesting other than nanotechnology except for the more traditional businesses. We're not ready with regard to understanding hyperspace. VC's could just sit on their money for a while and play it safe but for how long can they do that before their investors start clamoring for some returns? It's time for VC's to change the way they do things to get out of this rut they're in. We all have to learn to adapt and improve as the world and its market needs is dynamic. Why not start now? Now is as good a time as any.

On the other side, the fledgling nanotechnology entrepreneur needs to obtain expert help pitching their idea to the VC's or government for funding. A product or technology must have an application and a demand for it, a fact which is often ignored by earnest technology entrepreneurs, much to the chagrin of the business community and especially of the VC's who have to listen to their pitches. An objective technology and market assessment by an expert third party is a good reality check. Packaging your idea is important and some hype is necessary to grab attention but too much hype is a red flag. If you've never written a business plan, it might be a good idea to seek experienced help.

Here is something else to consider for both VC's and aspiring nanotechnology entrepreneurs. Nanotechnology research with immediate demand are those that will address the current national as well as global security issues that we are affronted with now. Our government is not only an investor, but also a customer...a very important and large customer with monies. This is the case because in turn we are their customers, even the VC's and the scientists. Defense spending is up and increasing for technologies to ensure safety of its citizens. So if you have research or a product that can be used for these types of applications, then you should position yourselves properly with expert help to appeal to the appropriate government agencies.

So VC's, not only is there plenty of room at the bottom, but there's plenty of room at the top also. Oh, and one more cliché, "Good things come in small packages."

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