Charlie Reid & Associates
STRATEGIC MANUFACTURING SOLUTIONS

Sizing Up Early-Stage Technology Companies

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In most regards, venture capitalist and private equity investors follow similar processes prior to making an investment in a target company but there are distinct differences. In both cases doing a rigorous investigation and evaluation of an investment opportunity before committing funds is critical. VCs and other investors rely on this due diligence to establish both the level of risk and the size of the return. Even the areas of concern are similar including: how compelling the competitive advantage of the company's product or service is, whether the business has established a unique market positioning, whether operating and capital cost estimates are reasonable, and whether sales momentum is growing etc.

However, because so little is known for certain about early-stage companies, performing due diligence is, in many cases, more complex than scrutinizing a mature technology company, and almost always more speculative. In early stage technology companies analyzing technical risks is about evaluating assumptions, threats, and the underlying quality of R&D timelines and commercialization/operationalisation plans. The best a venture capitalist can do is to establish "reasonability"; there's no precision in evaluating start-ups.

To understand operational/technical risk, a venture capitalist needs to consider the following:

The Target's Team

Early-stage technology companies are often staffed by employees who are closer to the world of academia than to the world of commerce. Often these companies are run by PhDs, and young scientists or engineers, full of enthusiasm but generally naive about business-case development or commercial operations. They don't necessarily understand the need for discipline in the R&D process and almost never understand the difference between product development and product launch.

They're emotionally attached to their individual pet projects and often lack objectivity on evaluating the risk of "dead-ends." This makes due diligence that much more difficult because in many regards the target's staff often aren't even able to understand commercially oriented technical questions. This is a generalization, but more often than not, staffers in emerging

technology companies need to be educated about commercialization as part of the technical diligence process.

The Value Proposition
Revenue-generation potential in emerging technology companies depends directly on the value the product will deliver to its prospective customers.

The first step in technical due diligence should be to establish how well the company understands its prospective customers' needs and how well these needs are being met by the target's product or services offering. This involves first evaluating the assumptions in the value proposition itself to see whether they seem reasonable. Contact with prospective customers can yield some insight. It's worth noting that in the latter case, prospective customers may attempt to downplay the value with an eye on future costs.

Perhaps not surprisingly, therefore, I often find that emerging technology companies undervalue what they are bringing to the market. Couple this with pricing approaches that are almost always "cost" plus some notion of reasonable margin (instead of value based) and you will often see under-pricing of the emerging technology product. Revenue-up opportunities can exist in these cases.

Due diligence results, in this regard, should present an evaluation of the "degree of reasonability" of the value proposition *and* pricing estimates, and a conclusion as to whether this enhances or detracts from the business case in the confidential information memorandum.

Product/Process Development Timeline
This risk factor is a concern in cases where the product or process isn't quite fully developed, or not developed at all.

Almost without exception, unless the emerging technology is the product of a large-company R&D spin-off, it's likely that development timelines will not reflect reality. Product development will usually take longer than the company thinks.

Here the existence of some kind of disciplined development process is key. One of the most common ones is the "stage gate" process, in which the development path has milestones at which minimum thresholds of technical accomplishment and progress must be achieved before proceeding to the next stage of the development process. If executed well, this prevents (or at least minimizes) overspend on development activities that can only be useful if the technical milestones are achieved.

Further, it's important to look for the existence of a "development project portfolio management process" or something I refer to as a "project kill process". Many R&D organizations, ***emerging or otherwise***, lack this discipline and this means that researchers can sometimes be working on unpromising projects or projects that are not on the "critical path." In emerging technology companies, it's particularly important that financial resources be focused on productive work. Paths that are not producing must be aggressively pruned. (Interestingly, this is a discipline that most funds understand as most have an internal process to minimize effort expended on unpromising investment opportunities).

The existence of a disciplined launch management process is also important. The automotive industry sets the bar in this instance having a well-defined and highly rigorous process known as "advanced product quality planning" (APQP).

The output from due diligence in this area of review will be an evaluation of the degree to which development and launch disciplines exist and the degree of threat to the proposed development timelines.

Technological Uncertainties
Technology companies rarely have a succinct understanding of the overall status of the individual technical areas within their development plan.

In conducting due diligence on these kinds of companies, it's useful to identify and clearly articulate the major areas of remaining technological uncertainty as well as the activities that are targeted at them and their projected likelihood of success.

The output in this area is merely a listing of the technical hurdles the target still faces. It's interesting that this compilation is often news to the business owners.

Operational Strategy and Launch Timelines
First, are the launch timelines reasonable? As noted above, the existence of an APQP process will aid greatly in providing confidence that launch timelines are realistic.

Does the company understand its medium-term operating strategy? What will it make? What will it buy? What equipment will it deploy? Does the company have enough capacity? Enough space? Are future suppliers known? Are they locked in? Are competing companies vying for the same supplies? (This is

critical if supply is limited!) Is the company using (or proposing to use) production technology that is appropriate for its product and volume levels? If the volume is low, the company can tolerate slow but flexible production technologies. These can be more costly in the short term (on a direct cost per piece basis) but permit the product to evolve more often than if hard tooling or higher-speed technologies have been deployed. Where will they produce in the long run? Often the home city will not be the right location for the headquarters.

Due diligence conclusions in this area should be an assessment of the degree to which the company has considered its operating strategies as well as the opportunities and threats associated with the plan.

CAPEX Plans
Are projected capital expenditure plans realistic and sufficient for the company's needs? Doing a reasonable job in developing operating strategy is the critical enabler here. The output of due diligence in this area will be an evaluation of the reasonability of the CAPEX projections phased over time.

Cost of Goods Sold
Projected costs of goods sold is what most venture capitalists want to evaluate. The key questions to answer are:

- Are the current bills of material up to date? Are they reasonable? Are projected bills of material reasonable?
- Are the cost versus volume curves reasonably derived or just lifted from a textbook?
- Are manufacturing costs projections supportable?
- Are operating strategies sufficiently robust to allow estimates of the capital required and thus establish reasonable overhead rates? Specifically, does the target know what it will make and what it will buy, which production technology it will use under different volume loads, and how will this transition take place over time?

The most common shortfall in this area is the use of projected cost versus volume curves that exist in any number of popular technology development texts, as the primary means of showing how COGS will decrease with volume increases over time.
Two examples are Moore's Law, and BCG's Experience Curve. The fact is that these curves are generally accurate predictors of an industry's cost vs volume behaviors, but wide variation exists in actual experience from individual company to individual company.

In any case costs don't come down with volume because of these laws; costs come down with volume because of planned execution of specific cost down initiatives. Cost will come down with volume as a result of a combination of things: material cost reduction (through pricing performance, substitution, and or design changes, etc.); process yield improvements; higher-speed production; better productivity, etc. The applicability of any or all of these approaches (and others) will depend on the specific characteristics of your target's product/process and whether they have a plan to exploit them

Due diligence should deliver an assessment of the strength of the cost-of-goods-sold estimates in the face of the above. Again, it's important to note that this assessment will be speculative.

IP Leakage

It's surprising how often emerging technology companies fail to adequately protect their intellectual property. Assessment of a company's IP situation should include answers to the following questions:

- Does the company have protection for its intellectual property?
- Does the company understand how its IP fits into the IP landscape around it? Who has similar IP? Who has threatening IP?
- Does the company understand where IP leakage can occur? Does the operating strategy consider this?

The diligence output in this area should be an assessment of potential IP risks.

Summary

It's ironic that due diligence is so much more complicated in emerging technology companies than it is in mature companies since the deal values are so much smaller and budgets for things like due diligence are accordingly much smaller.

The time and money needed to adequately assess the risk areas cited above can be quite high, but there are shortcuts that can be taken to minimize costs.

The good news about due diligence in emerging technology companies, though, is that going through it often represents an opportunity for the target's team members to learn about the practical elements of product development and launch. The work often creates a template for an operational strategy that will help the target succeed. In this regard the expense is really more of an investment in planning and execution. That's my story and I'm sticking to it.