

Crossing the Chasm

By LARRY ROSEN

How Start-Up Businesses Can Survive the Leap from Development to Production

As start-up companies seek to create competitive advantages, the development and commercialization of their new products demand not only innovation, but also flexible personnel—and product and process development specialists comfortable in chemical pilot plants.

The World Is Chemical

In virtually every manufacturing industry, chemicals are everything. And, everything is chemical. The cement you walk on, the textiles you wear, the coatings on your living spaces and coverings for your furnishings, the pharmaceuticals that keep you healthy, the food you eat, even the air you breathe—all are composed of roughly three dozen basic chemical elements. The world is chemical. Virtually every technological innovation has required advances in chemistry for its commercialization. Even wind turbines require novel materials to reduce weight and increase the strength of the blades, which can exceed 300 feet in length.

Through my work at Pressure Chemical Company, which often serves as a "test kitchen for hire" for chemical process and product development, I've enjoyed a unique vantage point on the attempts of small businesses to scale-up their innovations to commercial reality. The work in a chemical pilot plant such as ours is often the crucial juncture for a developing start-up. A small company attempting to "bridge the chasm" between development and large-scale production is prone to pitfalls that can spell its doom. It's been my observation that the companies that fail have certain attributes in common—just as the companies that succeed share certain characteristics.

Short on Everything

Start-up businesses tend to be lean and frugal: they don't have much time, they often don't have much money, and they certainly don't have all the people necessary to gain a broad perspective. However, they do have a firm belief and commitment to a potentially marketable idea. Many



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believe "this idea will sell itself. It's a no-brainer." At that point, a reality check might be in order. Some entrepreneurs are academics who might be entering the business world from a university setting. A common mistake that they or a technology transfer officer might make is to be overcautious, focused on confidentiality and protection of the idea from imitators, when they should be focused on sales and marketing.

Every innovator needs to have a realistic picture of what actual production costs might be at various production levels. Though initial estimates are often quite different from the eventual reality, a more common issue is underestimating the costs to produce at low volume and the time and cost to develop a manufacturing process and to produce prototypes.

For example, an entrepreneur might have an idea for a plastic paper clip. It's a great idea: plastic paper clips don't deform and are inexpensive to produce. But by the same token, they can't be made at the volume necessary without specialized tooling, which may cost hundreds of thousands of dollars. So producing the first few has no bearing on what it might cost to manufacture them in large quantity. That reality is frequently lost to the entrepreneur.

The start-up is typically undercapitalized because it hasn't utilized a multidisciplinary team to uncover potential pitfalls by asking the right questions. So they'll approach manufacturers with a very naïve picture of what their costs are going to be, exacerbated by a reluctance to provide the necessary details because of fear that the idea will be stolen. This is a combination of rookie mistakes that can often prove lethal for a start-up.

What Start-ups Need

Multidisciplinary Teams

An integrated team—for example, one that includes chemical and process engineers, material scientists, and marketing and manufacturing specialists—can ask the hard questions for a start-up before they approach a pilot plant. Where are the raw materials going to come from? How much do they cost? What is the ultimate value of the material that you're asking to be made? If you don't know, then you'll need to find out before proceeding.

Good advisors

Knowing how to ask the right questions is something they don't teach you in school. That's why you need experienced professionals on your team, people who can boil all the available information down to what is truly relevant. A good lawyer, a savvy accountant and an experienced marketing specialist are all invaluable.

Realistic Business Plan

More often than not, entrepreneurs will need to make substantial revisions to their business plan before all is said and done. Many will discover that their production costs need to come down

dramatically before a new product can be manufactured, and some, unfortunately, will discover that they simply can't afford to be in business in the first place. For example, an entrepreneur might come to a chemical pilot plant with plans to manufacture a large piece of equipment, but producing the chemical that makes it work costs them 10 times more than what they feel it should ultimately cost. They'll ask for assurances that a year from now, the cost will be one-tenth of the current cost, a request that they'll be told is unrealistic.

The start-up didn't do its homework. Consequently, they may discover that production of their equipment isn't viable after all. And they discover this late in the game because of a single faulty assumption.

Concept to Commercialization

Which brings us to the innovation model that I've seen work effectively for a number of companies—how they can alleviate the problems associated with conventional innovation methods and speed up the route from prototype to production. It's a process called Concept to Commercialization (C2C).

Successful outsourcing of product and process development requires three crucial elements to be in place:

- flexibility in process options
- diversity of professional backgrounds within the development team
- "hands off" management control over the process

In order to verify the efficacy of a variety of processes in a short time frame, a wide diversity of equipment and configurations must be readily available. Much like a custom woodworking shop or a test kitchen, where many tools are available but relatively few are employed at a given time, an environment designed for product development requires a workspace devoted entirely to concept prototyping and verification.

Many of the companies that come through the doors of our chemical pilot plant who are successful in developing new chemical products and processes follow at least three of the following principles: accurate identification of a problem and its market; conceptualization of alternative ideas and approaches; integration of rapid prototyping and multidisciplinary teams; evaluation of prototypes; and qualification of the test prototype relative to marketing demands.

Many companies that have reached the prototype stage faster have:

- Built multidisciplinary teams including chemical and processes engineers, material scientists, and marketing and manufacturing specialists.

- Conducted research in concurrent/overlapping stages, which is a dramatic departure from the traditional gated process. First-class innovative development requires real-time interaction between the disciplines that supply input into the process on all layers and levels. Though it may seem chaotic and be more difficult to manage, such a process yields faster and better results while actually reducing risk.

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More information:

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