For Their Inventions to Reach the Market, Researchers May Need a Venture-Development Assist

By Alexander C. Kafka

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The early phase of an innovation’s development into a commercial product is called "the valley of death" because that’s where most new technologies perish. Companies and even venture-capital groups are wary of betting on untested new gizmos and processes, the kind your university’s researchers are working on right now.

Enter venture-development firms. They vet ideas, study markets, match researchers with seasoned executives,
and sound out investors. They "de-risk" the innovation in a start-up and fatten it up enough for the venture-capital firms or big companies to swoop in. And they are becoming the new normal in commercialization, or tech transfer.

For example, David Arreaga and two fellow graduate students in engineering at the University of Texas at Dallas were working on flexible polymer display plates for biomedical devices. Realizing that their invention was applicable to a broader electronics market, they connected with a company called Opus Faveo Innovation Development, which helped them and the university’s Office of Technology Commercialization with the patent application and license negotiations.

Five years later, Arreaga and his two co-inventors are the management team for a company called Ares Materials that is poised to do tens of millions of dollars in business with companies in Asia and elsewhere.
What to Consider Before Working With a Venture-Development Firm

You’re an academic with an idea for a clever gizmo or process. You’re wondering if you should seek help from an outside investor specializing in early stages of product development. Here are some questions you should be able to answer, says Mark Crowell, an independent consultant in Chapel Hill, N.C., who has worked in commercialization since the late 1980s.

**Are there rules** at your university and in your contract regarding exclusivity or otherwise limiting or defining your ability to forge relationships with an outside firm?

**Do you have a clear understanding** of the stage of development — proof of concept, technology readiness, prototype — that you’ll need for the venture-development firm to evaluate your innovation?

**Does the venture-development firm bring value and resources** to the table beyond its money? That is, does it have innovation accelerators and related business-development expertise and facilities? Does it have networks from which to draw a prospective CEO and a board of advisers with start-up experience in your field? Does it have a pipeline of deals with strong co-investors?

Cognovi Labs, in Columbus, Ohio, further developed software by engineers at Wright State University’s Kno.e.sis Center to build a product that can predict behavior based on the tone of social-media posts. With 15 employees, Cognovi, since its start in 2016, has raised more than $3.5 million in seed capital from investors, says Beni Gradwohl, the company’s CEO. Customers include hedge funds, retail brands, and political organizations. The firm that helped Cognovi get off the ground is Columbus-based Ikove Capital.

Here’s how such arrangements evolved.
In the traditional model of tech transfer, an academic researcher who comes up with an invention or develops a technology discloses it to the university’s technology-transfer office. That office files a patent application and then, ideally, licenses the invention to a company that develops it into a product. If the product is successful, the university and the researcher receive fees and royalties.

But companies have gravitated toward less risky, later-stage technology, making the commercialization of university inventions more challenging. Venture-capital firms and more modestly resourced angel capital groups moved in during the 1990s and early 2000s to help fund early development and prepare technologies for sale to larger companies. That model had some success with pharmaceuticals, less so with many other technologies that were too nascent to be licensed. And after the 2008 recession, those venture-capital investors backed off too.

Over the last decade, particularly during the last five years, the venture-development firms — sometimes called venture-building or early-stage venture-capital — have moved in to fill that vacuum. Direct licensing and traditional venture capital still play a role in commercialization, but venture development is becoming a far more common preliminary stage.

When researchers work with venture-development firms like Opus Faveo and Ikove, those firms become general partners, investing their own money and encouraging their networks to invest as well. They provide executive guidance and often leadership too, as well as back-office support for human-resources, accounting, and other operations. Universities still generally get licensing fees from, and equity in, those start-ups. They’re just handing off to a different type of partner than they were before.
"The profession has changed," says Stephen J. Susalka, chief executive of AUTM, a global nonprofit that represents 3,000 technology managers at 800 research institutions, about 80 percent of which are universities. A record 1,080 start-ups were formed in 2017, according to the most recent figures available from the organization’s annual U.S. licensing survey, and 6,050 start-ups reported in previous surveys were still operational. Far from resisting the venture-development trend, tech-transfer offices welcome them as partners, Susalka says. AUTM even runs start-up workshops to inculcate venture-development thinking within universities.

**Risky Business**

While university tech transfer has existed, in some form, since 1925, the 1980 Bayh-Dole Act was transformative because it allowed academic researchers and their institutions to profit from discoveries made while using federal research grants. Before that, accepting even a dollar from Uncle Sam, who sponsored about 70 percent of all research, meant that the government, not the inventor, owned the intellectual property. The Bayh-Dole shift in incentives unleashed a hurricane of innovation — more than 380,000 inventions, including devices, processes, and 153 FDA approved drugs in the last quarter-century, according to AUTM.

Tech transfer has also sometimes brought huge returns. In one marquee example, Stanford University reaped $336 million in fees from helping two of its grad students in 1996 start a little company called Google (now worth an estimated $748 billion). New York University has made hundreds of millions of dollars from royalties and gifts associated with Remicade, a rheumatoid-arthritis drug.
And sometimes, of course, tech transfer is more purely about impact. George Whitesides, a Harvard University chemist, invented a microfluid chip the size of a thumbnail. It can test for liver function, micronutrient levels in children, and vaccination coverage. Whitesides and like-minded colleagues distribute the chip in the developing world through a nonprofit company called Diagnostics for All.

But high-profile successes, whether commercial or philanthropic, are the exceptions, says Mark Crowell, a tech-transfer veteran who has been in the industry since the late 1980s and now works as an independent consultant in Chapel Hill, N.C. "Every university hopes and prays that overall income stream will be at a high enough level" to make its tech-transfer office self-sustaining, he says, but "no more than 10 to 20 percent actually reach that goal."

The climb to market is steep. Even getting to invention disclosure, the step before a patent application is filed, takes an average of $2.7 million in research funds, AUTM’s Susalka says. The cost to bring a medication from lab to pharmacy shelf, according to a widely cited Tufts University study, is $2.7 billion.

Some of the venture-development firms that help innovators in that daunting ascent work in a geographic or topical niche. Ikove, for instance, focuses on academic innovation in the Midwest. The giant Deerfield Management deals only with health care. Among its investments are $100 million in "translational," or preclinical, medicine at Harvard University and $65 million in drug development at the University of North Carolina at Chapel Hill.

Getting a product to market without venture-development help is difficult at best — some industry players say it’s virtually impossible. And a few universities, in addition to working with outside venture-development firms, have essentially
started their own internal ones too.

**Universities as Investors**

A pioneer in that approach is Bryan K. Ritchie, who came to the University of Notre Dame in 2016 as vice president and associate provost for innovation. He had previously led commercialization offices at the Universities of Utah and of Washington and run venture-capital and start-up companies in the private sector.

Notre Dame has had "100 years of branding for a football program and a basilica bolted to a small liberal-arts college," he says. It has not been known as a powerhouse product innovator. But with the university’s research funds increasing from $20 million to $250 million over the last decade — even without a medical school — he hopes to change that. He brought four people from his University of Utah operation and plans to do "better by half what we did at Utah." That’s saying something, because at Utah, as associate vice president for research for five years, he oversaw the start of almost 200 companies.

Of traditional tech-transfer offices, "I don't think they ever worked," he says. "I think what happened was you got a few universities able to monetize a few molecular drug discoveries." That fueled the reactive sifting-for-gold mentality of tech-transfer offices nationwide. Generally those outfits file patents for arbitrary discoveries that come their way — "solutions looking for problems," Ritchie calls them — and try to sell licenses to skeptical companies too early in a product’s development.
His shop, he says, "obliterated" that model. Instead, he and his team of about 30 doctorates, M.B.A.s, and recent graduates of Notre Dame’s entrepreneurship program usher innovations through what he terms "the chasm of chaos." The first stage is to triage intellectual property, the second is to sketch a potential business model, and the third is to reach $1 million in revenues. The office reaches out, he says, to a broad alumni base "to get the right eyes on what we’re doing." The core group of 30 professionals is also assisted by 130 undergraduates studying entrepreneurship. And the office networks with some 30 to 50 venture-development companies outside the university.

Like those external venture companies, Ritchie’s office — called the IDEA Center (Innovation, De-risking, and Enterprise Acceleration) — has skin in the game. It raised $24 million, what he calls "an internal venture-development fund," from which it draws seed money for new enterprises. It started 27 companies last year and is on pace, he says, to start 30 this year.

Such an operation "is not for the faint of heart," Ritchie says. But he’s evangelical, responding to requests from universities in the Southwest and abroad for advice on beginning their own such enterprises. An MIT, Stanford, or University of Washington can capitalize on their proximity to tech hubs, he says. The Purdues, Colorados, Utahs, and Notre Dames of the world need to make their own magic.

"This is absolutely doable," he says, "and something universities should think hard about."

Entrepreneurial Youth
The entrepreneurial undergrads at Notre Dame reflect a more general youth movement that is influencing the nature and tone of commercialization in academe. Growing up watching barely postadolescent CEO’s helm start-ups, these students aren’t waiting around to make their mark, and investors aren’t waiting around to help them.

You’ll find some such students at the University of Southern California’s Iovine and Young Academy for Arts, Technology and the Business of Innovation.

**Innovation, by the Numbers**

How many devices, processes, medications, and other inventions come from academic research? AUTM, an association of technology managers, does a yearly survey to find out. In 2017, the latest year for which survey data are available:

- **$68.2 billion** was spent on research.
- **15,335** patent applications were filed.
- **7,459**
7,459

patents were issued.

7,849

licenses and options — the agreements that give companies the right to manufacture a product — were signed.

755

new products were created.

1,080

start-ups were formed.

Source: AUTM 2017 survey

"In my opinion, students today are by nature more entrepreneurial," says Erica Muhl, who has directed the academy since it was founded in 2013. "Their way of thinking has been developed by a fully functioning internet and technology that has provided a real platform for do-it-yourselfers." She sees a rising number of high-school graduates itching to start their own ventures.

And they do, sometimes as early as freshman or sophomore years of college. Among the first academy cohort, which graduated in 2018, are founders of Mira, a company making inexpensive smartphone-compatible augmented-reality headsets aimed for use in the workplace. Within a year of its founders’ graduation, Mira is already selling and shipping, and has raised $6.5 million in capital funding, including by Sequoia, the capital group that helped launch
Apple, Airbnb, and LinkedIn, among many other ventures. The spring-2019 USC academy cohort, Muhl says, includes founders of two start-ups invited to join Y Combinator, which takes a small stake in new firms and helps them prepare their pitches to other investors.

The university’s tech-transfer office, the Stevens Center, sometimes gives students advice on legal and patent issues, Muhl says. They need it, because "we are fortunate in that a number of our start-ups receive funding before they even graduate."

These hungry young entrepreneurs, commercialization veterans say, will find plenty of activity to sink their teeth into.

"There’s a lot of money out there that’s still sitting on the sidelines," says Christopher Hayter, an assistant professor at Arizona State University’s School of Public Affairs who studies capital markets and has held entrepreneurship-policy positions with the National Academy of Sciences, the Council on Competitiveness, the National Governors Association, and elsewhere. "The biggest challenge," he says, "is connecting innovators with experts outside the university who can help them make it to the big leagues."

Crowell, the consultant, thinks universities are awake to the potential. Thirty years ago, he says, tech transfer was "an ugly stepchild" within most universities. Now they all tout innovation as a priority. Most also understand that it’s a complicated process and that seeking outside help is no sin.

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