The 4M Framework For How University Innovations Get Commercialized, And Corresponding Ways To Optimize University IP Policies And Practices

By Michael Cohen

Overview

Universities establish policies and practices for managing their intellectual property (IP) in order to achieve a variety of objectives—one of which is typically the fast, broad commercialization of university-developed innovations for the purpose of (a) benefiting society and the regional economy, (b) supporting research and education, as well as (c) rewarding inventors for their ingenuity. Accordingly, understanding how university innovations get commercialized to meet those objectives is important in optimizing a university's IP policies and practices. However, many university executives don't have a comprehensive understanding of the pathways by which innovations get commercialized on their campuses. To address this disconnect, this article proposes a new framework for characterizing how innovations get commercialized at universities, and then the article analyzes IP licensing, patenting, and related aspects of sponsored research in the context of this new framework in order to help universities strategically optimize their IP policies and practices.

Commercialization Pathways

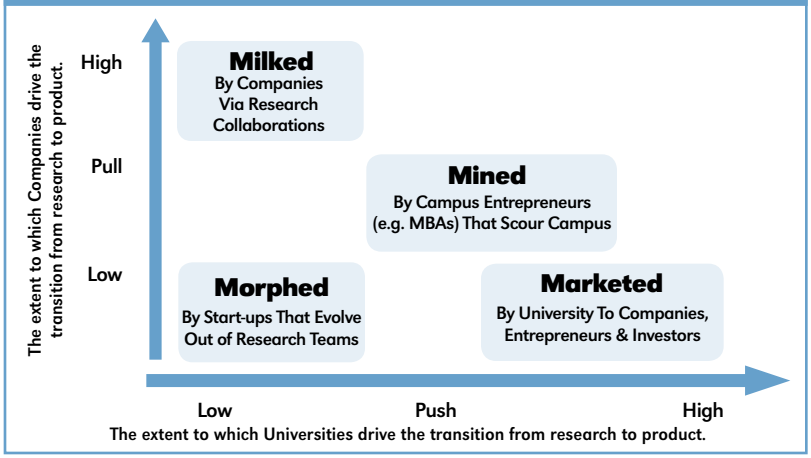
Innovations developed at universities get commercialized through a variety of pathways. These pathways can be organized into a framework that can be used to optimize a university's IP policies and practices such that the IP policies and practices strategically help drive the commercialization of innovations.

One common framework for how innovations get commercialized at universities is sometimes referred to as the "push versus pull framework." The push side of this bifurcated framework represents the pathway in which a university proactively markets its innovations in order to interest companies in commercializing the innovations (as well as possibly licensing associated IP rights and sponsoring related research). In contrast, the pull side of this framework represents the pathway in which a company becomes aware of a new innovation via the company's collaborations with university researchers and then that company proactively proceeds to commercialize the innovation (and sometimes license the IP from the university or abscond with the IP).

This conventional push-pull framework doesn't expose key differences in the variety of ways that innovations get commercialized at universities; and consequently this simple framework doesn't provide the insights required to strategically guide a university's IP policies and practices.

However, the push-pull framework can be expanded from its two segments into a two-dimensional matrix in which the x-axis represents the extent to which a university systematically drives the transition from research innovation to product commercialization, and the y-axis represents the extent to which a company proactively drives the transition from research innovation to product commercialization. By plotting in this framework numerous examples of how university-developed innovations have been commercialized, four common pathways become evident (see Figure 1). This new framework's four

Figure 1. The 4M Framework of Innovation Commercialization at Universities



common pathways are referred to as: *Morphed, Mined, Milked and Marketed*—and together they are called the *4M Framework of Innovation Commercialization at Universities*. Each of the 4M pathways is highlighted below.

Morphed: The morphed pathway of university commercialization occupies the lower left quadrant of the 4M framework in that relative to other pathways the morphed pathway isn't driven by systematic university or corporate activities. Morphed commercialization occurs when one or more members of a research team (e.g. professor, post doc, and/or grad student) proactively transition their work from research into product development, and in so doing they morph into a company to commercialize the innovation. While this pathway doesn't require marketing by the university or involvement by an established company, morphing can be instigated and nurtured by an entrepreneurial culture and easy access to start-up resources (e.g. venture capital, incubators, mentors, attorneys, etc).

Mined: The mined pathway of university commercialization occupies the upper right area of the 4M framework in that relative to other pathways, mining can be driven by systematic university and corporate activities. Mined commercialization occurs when entrepreneurs in the campus community—particularly MBA students, periodically scour the university's innovations for an opportunity that they want to pursue as a start-up business; and when their mining strikes a suitable innovation, then they form a team to pursue the opportunity. Within the 4M framework, this mined pathway has grown the fastest in recent years. Mining can be fueled by (a) admitting entrepreneurial students into the university, (b) establishing campus events that reward entrepreneurialism—especially business plan competitions, (c) organizing campus programs that get business, engineering and science students to exchange ideas (i.e. poster sessions and clubs), as well as (d) marketing innovations to the campus community (i.e. via Web listings that are searchable and emails that are targeted to students in specific clubs and programs).

Milked: The milked pathway of university commercialization occupies the upper left corner of the 4M framework in that it is largely driven by companies. Milked commercialization occurs when a company that is collaborating with university researchers proactively integrates a resulting innovation's know-how (and sometimes the associated IP) into their internal R&D. This pathway is driven by collaborations such as university-industry consortia, corporate sponsored research, visiting industry fellows, and faculty consulting.

Marketed: The marketed pathway of university commercialization occupies the lower right corner of the 4M framework in that it is largely driven by institutionalized university activities. Marketed commercialization occurs when companies, entrepreneurs and/or investors launch commercialization efforts for a particular innovation after learning about that innovation via university activities that enable outside parties to become aware of commercialization opportunities. Such marketing activities include newsletters, email notifications, searchable Web listings and patent publications. Usually, these innovations didn't get morphed, mined or milked because when they were initially developed their technology and/or market were too nascent to rationalize a risky investment to try to commercialize the innovation. However, the university's ongoing marketing efforts enable companies, entrepreneurs and investors to be periodically apprised of innovations so that they can be commercialized if and when their technology and market mature to the point of justifying the investment.

■ Michael Cohen,
UC Berkeley, Office of Intellectual Property & Industry Alliances, Director, Acting, Berkeley, CA, USA
E-mail: mcohen@berkeley.edu

Note that within the 4M framework some commercialization scenarios are hybrids of two or more pathways. For example, if company that is sponsoring research subsequently funds a graduating member of the research team who is forming a start-up to commercialize the research results, then that could be characterized as a hybrid of the milked and morphed pathways.

Influencing Commercialization

Using this 4M framework, a university can assess its commercialization successes, and determine which pathways are working on its campus as well as which pathways need supporting or jumpstarting. IP policies and practices can then be refined to address these needs.

However, before identifying IP policies and practices that can address a university's particular needs, it's important to emphasize that IP is not the only factor that can influence innovation commercialization on campus. For example, know-how is frequently more important than IP in getting university inno-

vations commercialized. However, in contrast to IP, universities don't own know-how. Instead, know-how is the asset of individuals (e.g. faculty), and therefore universities can't readily manipulate policies and practices for know-how in order to influence commercialization.

In addition to IP, other areas that universities can optimize to impact commercialization include the policies and practices of (1) campus research (e.g. steering the direction of research), (2) campus education (e.g. teaching entrepreneurial skills), and (3) campus culture (i.e. via admissions, programs, and events). However, these areas are beyond the scope of this article. Likewise, federal, state and local governments can also impact commercialization through their funding of research, education and infrastructure—but government policies and practices are also beyond the scope of this article.

IP Licensing and Patenting

As a starting point to describing how IP can influence each of the 4M commercialization pathways, it's useful to summarize how university IP licensing and patenting impact the commercialization of innovations—in general.

For companies, the primary benefit of licensing IP from universities is that the obtained legal rights can (a) improve the potential financial return (i.e. via exclusive licensing), or (b) lower the potential risk (i.e. via non-exclusively licensing) on a large, long-term investment to try to commercialize a university-developed innovation. In other words, licensing IP from universities enables companies to improve their investment opportunities. It's worth noting that, conversely, if commercializing an innovation doesn't require a large, long-term risky investment, then licensing IP from universities isn't necessarily beneficial to companies (except to the extent that licensing prevents litigious universities from asserting IP infringement against companies).

For universities, the benefit of licensing IP—in addition to the above method of catalyzing commercialization (which, alone, is an important goal for many universities), is that licensing proceeds (e.g. royalties, equity and fees) can reward the university inventors for their ingenuity, and also help fund the university's research and education. Here again it's worth noting that, conversely, if the IP rights to an innovation aren't likely to result in material proceeds from licensing (or even a license), then the patenting and licensing of an innovation's IP isn't necessarily beneficial to universities.

In summary, there are two primary reasons for universities to grant IP licenses and for companies to obtain IP licenses: (a) to provide catalysts for commercialization, as well as (b) to provide income for inventors and funds for research and education. These primary benefits of licensing correspond with the primary benefits of patenting innovations—with one small but distinct exception. In addition to being an asset for catalysis and compensation (via licensing), sometimes patenting is worthwhile in order to cater to (or coddle) faculty-inventors. More specifically, if a professor is enamored with an innovation, then that person can get upset if the university doesn't patent that IP. The upset professor can then promulgate an attitude in a department of 'why take the time to disclose inventions to the university if the university won't patent and license them'. So this kind of coddling can foster invention disclosures from some (temperamental) faculty and their departments.

Moreover, filing patents in order to assuage temperamental inventors doesn't have to be expensive as the university can file provisional patent applications—and during the ensuing year covered by the provisional filing, if there isn't any commercial interest, then that market data can be used to justify to the inventors that the university is making a prudent decision to not continue the prosecution to a more expensive non-provisional patent filing. Note that provisional patent filings can be an advantageous patenting strategy—even when not coddling inventors.

IP Policies and Practices

Now that the common pathways for innovation commercialization at universities have been framed, and the general motivations for university licensing and patenting have been clarified, let's consider approaches to IP that can drive (or at least facilitate) each of the four, commercialization pathways.

IP Policies and Practices for Morphed Commercialization:

What kind of IP policies and practices encourage (or at least facilitate) morphed commercialization? First and foremost is the judicious use of short-term IP rights agreements that are simple and inexpensive, but reserve the morphed start-up's IP rights while it's still incubating the technology.

Simplicity is key because morphed start-ups don't want to spend a lot of time on the transaction nor do they want to pay an attorney to represent them for this transaction. Therefore, this situation is amenable to straightforward, short-term IP letter agreements that are just a few pages and clearly delineate (without legal jargon) the responsibilities and commitments of

the start-up and the university.

Likewise, low-cost is important for morphed start-ups because they have little, if any cash to spend on the IP transaction—in fact many morphed start-ups don't have revenue or funding, and aren't even incorporated yet. Accordingly, this situation is conducive to low-cost, short-term IP letter agreements that have a nominal up-front fee and/or patent reimbursements commitments that are phased over time.

IP Policies and Practices for Mined Commercialization:

The IP policies and practices that encourage or at least facilitate the mined pathway for commercialization include those described for the morphed pathway, as well as activities that market university-derived innovations. Examples of activities that market innovations are the posting and targeted distribution of (a) research breakthroughs that result in innovations, and (b) available IP rights associated with innovations. The marketing of university innovations is beneficial to the mined pathway because it can make the mining process more efficient by directing entrepreneurs to innovations that not only (a) match an entrepreneur's interests, but also (b) have IP licensing opportunities that can help catalyze investments to fund a mined start-up.

In deciding whether a university should pursue the patenting of an innovation, it's worth observing that strong patent rights aren't necessarily required to help mined start-ups. The reason is that just exclusively licensing IP from a reputable university can help a mined start-up attract investors (and improve the start-up's valuation).

IP Policies and Practices for Milked Commercialization:

The IP policies and practices that encourage or at least facilitate the milked pathway for commercialization are mostly related to the IP terms in research agreements with companies. Depending on the type of industry and nature of the research, some companies (and consortia) are indifferent to IP and others are persnickety about IP terms.

If a company is considering large investments in university research and expects the research to possibly result in useful IP, then that company doesn't want the potential IP to be (a) blocked by existing background IP that the university has exclusively licensed, or (b) covered by onerous license terms that the university could impose in the future.

To address the possibility of blocking IP, some universities are increasingly entering into large (multi million dollar) research agreements that require universities to enumerate prior IP (i.e. invented by principal investigators) in order to identify potential background IP and its availability for licensing.

Likewise, to address the concern of prohibitive IP license terms, some universities are increasingly entering into large sponsored research agreements that guarantee the sponsor a non-exclusive, royalty-free (NERF) license to IP that results from the performance of the agreement. The NERF works for companies because if an innovation that results from the sponsorship is useful but not strategic to the company, then the company can be assured that it can use the innovation without incurring an expensive license; and if an innovation is strategic, then the company can enter into an exclusive license under reasonable and nondiscriminatory terms (RAND).

In addition to particular IP terms of research agreements (as noted above), the judicious use of IP option agreements can also encourage the milked pathway of commercialization. In comparison to simple, short-term IP letter agreements and large, long-term IP license agreements, IP option agreements enable companies to reserve IP rights for a period of time commensurate with the time required to further develop and evaluate an innovation. Moreover, these IP option agreements can specify financial terms (or ranges), and thereby decrease the company's uncertainty regarding the economics of commercializing the innovation.

IP Policies and Practices for Marketed Commercialization:

The IP policies and practices that encourage or at least facilitate the marketed pathway for commercialization are largely dependent on activities that robustly market university innovations—and in particular the IP rights of innovations.

As mentioned earlier, a university-developed innovation is often commercialized by (a) applying the know-how of researchers that developed the innovation, and/or (b) leveraging any IP rights associated with the innovation. However, if an innovation wasn't morphed, milked or mined at around the time that the innovation was developed, then often the university know-how isn't readily available to subsequently help commercialization efforts because the know-how gets dispersed (i.e. students graduate) or becomes stale (i.e. professors evolve their research). Consequently, IP becomes the university's remaining asset that companies can leverage in the commercialization process—and that's why this marketed pathway of commercialization is largely reliant on the marketing of IP rights.

Robust IP marketing can be characterized as acting like a customer-oriented company not a procedure-oriented bureaucracy. More specifically, IP marketing initiatives need to proactively find companies, entrepreneurs and investors that could be amenable to commercializing specific innovations and correspondingly licensing associated IP rights (and possibly sponsoring related research). Moreover, university IP marketing needs to work at the speed of business—which expects turn-around in hours or a business day—not many days or weeks. And finally, university IP marketing needs to be flexible by (a) listening to the needs of companies, (b) taking the time to educate companies about the university perspective, and (c) creatively addressing issues.

Summary

Establishing IP policies and practices that encourage the commercialization of innovations at universities requires a comprehensive understanding of the pathways by which innovations get commercialized on campuses. The new 4M Framework articulates the common pathways for commercialization at universities, and accordingly this framework is useful for assessing a university's commercialization strengths and weakness, as well as correspondingly optimizing IP policies and practices that leverage commercialization strengths and resolve commercialization weaknesses. ■