You Can't Push a Rope or Legislate Innovation, So What Has Bayh-Dole Done For Me Lately?[1]

By Daniel I. Jamison IV

As a practitioner of intellectual property based business development, I am a firm believer that "amateurs study tactics; professionals study logistics."[2] I recently attended the LES Spring Meeting in Boston ("IP for Entrepreneurs and Universities, Commercializing Early Stage Technologies") where one of the plenary speakers opined that patents just aren't that important to certain fields of early stage technology development. Intrigued by this seemingly counterintuitive observation, I began to hear the same or similar statements from presenters and audience participants, and during the networking events. As I researched this paper, I began to find evidence of this same observation throughout the macro-environment in which we, as licensing professionals, perform or contribute our services. If patents are not important to the development of early stage technology, why have we focused our attention on increasing the number of patents filed on early stage technologies and why do we credit this increase in patenting with the growth of the economy since the Bayh-Dole act became law in 1980? We find our profession at the confluence of many policies, goals, objectives and schools of thought that have their roots as far back as the beginning of the United States of America, and as recent as the latest judicial interpretation of our work. We are influenced by history, legislation, the regulatory environment and public policy, behavioral psychology, even the taxonomy and semantic interpretation of the language used in our field. We often face a multiplicity of stakeholders in our engagements, each of which has a different goal or objective, and each of which participates in and responds to our interaction using the same lens, but a different perspective and focal length. I would respectfully suggest that in order to be successful in our future endeavors, we must begin with the end in mind, and then proceed with the beginning in mind. Where are we, what do we have, and where do we need to get it to. Logistics.[3]

It has been thirty years since the Bayh-Dole Act (1980) first (ostensibly) allowed universities (as well as small businesses and not-for-profits) to patent the results of U.S. government funded research in their own name. For much of this period, it has been generally accepted that this piece of legislation single-handedly "unleashed the previously untapped potential of university inventions" and "had much to do with the miraculous restoration of U.S. competitiveness in the 1980s."[4] That somewhat self-serving braggadocio by one of the bill's authors notwithstanding, most would argue that the "High Performance Computing and Communication Act of 1991" (HPCA) (Al Gore's famously misquoted as "I invented the Internet" legislation) had much more to do with the free flow of information that accelerated the growth of the economy during the latter part of this 30 years than did the Bayh-Dole act. However, not hindering commercialization is not the same as unleashing inventions. More importantly, unleashing inventions should not be the goal. Innovation is much more important than invention because it puts the invention into an economically attractive vehicle that will be more likely to achieve the goal of benefitting society through the forces of a free market. Despite alternate theories, necessity is usually the mother of invention,[5] but innovation can only occur when you combine *"…the understanding of science and*

1. The views, opinions, positions or strategies expressed by the author do not necessarily reflect those of Synaptics Incorporated.

2. van Creveld, Martin. *Supplying War*, Cambridge University Press, 1977. Sometimes attributed to Omar Bradley.

3. Logistics (n) (functioning as singular or plural) (1) (Military) The science of the movement, supplying, and maintenance of military forces in the field. (2) (Economics) The management of materials flow through an organization, from raw materials through to finished goods. (3) The detailed planning and organization of any large complex operation. Collins English Dictionary—Complete and Unabridged ©, HarperCollins Publishers 1991, 1994, 1998, 2000, 2003.

4. Bayh, Birch, Joseph P. Allen, and Howard W. Bremer. "Universities, Inventors, and the Bayh-Dole Act." *Life Sciences Law & Industry Report*. 3.24 (2009): Print.

5. …although it may have been fathered by Professor Harold Hill (*"The Music Man"*). Bayh-Dole are at best godparents, uncles, or Statler and Waldorf, the two guys in the balcony in the Muppet Show mumbling something about *"…the most inspired piece of legislation to be enacted in America over the past half-century…" ("Innovations Golden Goose," The Economist Technology Quarterly (editorial), 14 Dec. 2002).*

technology with market knowledge, leadership, risk taking, financing, manufacturing and more in a new, commercially useful way."[6]

Professor of Law J. H. Reichman at Duke University takes a historical perspective on the logistics of moving early stage technologies into the public domain where innovation is more likely to occur. Reichman points out that American universities always tended to balance practical and theoretical research, and that a natural (and productive) interaction between university and industry occurred throughout the history of the United States.[7] University research results tended to make their way into industry as graduates were hired by industry and continued to develop their body of work, or as research results were published, presented at conferences, or through consulting work performed by faculty. Reichman gives much more credit for the increased involvement of universities in patenting and licensing to the expansion of patentable subject matter that resulted from *Diamond v. Chakrabarty 447 U.S. 303 (1980)*, as well as the creation of the United States Court of Appeals for the Federal Circuit (CAFC) in 1982. This shift towards broader, stronger, better defined, and more enforceable intellectual property rights caused the marked increase in university patenting and licensing, and he refers to a conclusion reached by David Mowery *et al.*, that Bayh-Dole was "*an effect, not a cause*" of this surge.[8]

But can innovation be legislated or codified? Proponents of Bayh-Dole would appear to claim that you can, but Bayh-Dole focuses on inventions, patents, and licensing, not innovation. Publicly funded "think-tank" approaches to inventing increased during the middle part of the last century, particularly in health and defense initiatives. These approaches were very successful at generating inventions but not necessarily very adept at implementing them beyond the immediate scope of the research. After World War II, Senator Kilgore proposed using technology transfer (and retention of the ownership of the patents by the federal government underlying the technology) to effect a greater good from federally funded research. He proposed to place the patents in the public domain to avoid a "give-away of the fruits of taxpayer-funded research."[9] This ironic tautology was addressed earlier by Frederick Cottrell in 1912 when he said *"… what is everybody's business is nobody's business."*[10] Vannevar Bush, who had been the director of the Office of Scientific Research and Development during World War II, held an opposing view, pushing for the ownership of the patents by the contractors who had received federal funding (with a royalty free license to "Government.")[11] Bush's belief was that market and economic forces and incentives acting on these contractors provided the most efficient way to migrate research and development results into the public domain and foster the innovation required for the early stage technology to achieve commercial success and widespread adoption.

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Unfortunately, during the ensuing thirty years the U.S. government became much more active in its attempt to "manage" markets and market forces than they were in actually understanding how these forces efficiently transformed inventions into innovation. Federal "watchdogs," never a fan of organization, alignment and efficiency, often branded such activities as "monopolistic," in a sort of "McCarthyistic" fire branding of the "guilty" party. The breakup of AT&T was a classic example of this. Most of us are aware that AT&T was broken up into "Baby Bells," but many of us don't realize that the government efforts to do so were actually begun in 1949, just 2 years after the invention of the transistor at Bell Labs. Invention in the Bell System was cross subsidized by the service "monopoly" which did, in fact, charge users much more for the delivery of basic telecommunications service than those services cost to deliver. What escaped the ever watchful eye of regulators was that this "excessive cost" was actually the cost of a chain of activities which started with

6. De Beers, F. (2005). "Commercialising And Marketing Your IP TO Optimize Your ROI." *les Nouvelles*, Volume XL, No. 4, December 2005, pp. 165-171.

7. Reichman, J. H. "University-Industry Collaboration: The United States Experience." *WIPO Conference Paper*. 2005: p.2. *http://www.wipo.int/academy/en/meetings/iped_sym_05/papers/pdf/reichman_paper.pdf.*

8. Mowery, David, Richard R. Nelson, Bharen N. Sampat, and Arvid A. Ziedonis. *Ivory Tower and Industrial Innovation*. Stanford University Press, 2004: p.97 Print.

9. Mowery 86.

10. Cottrell, Frederick G. "The Research Corporation, an Experiment in the Public Administration of Patent Rights." *Journal of Industrial and Engineering Chemistry* 1912 Volume 4: P. 865.

11. Bush, Vannevar. "The Kilgore Bill." *Science* 1943 Volume 98: P. 571-577.

basic research, from which inventions were derived, and from which innovative solutions emerged that benefitted the consumer of telecommunication services. Inventing was a recognized requirement of this value chain (at least by AT&T) for AT&T to remain in business in a rapidly evolving technology market and a rapidly expanding user base. The transistor, for example, was developed to improve the performance of vacuum tubes that were then in use to amplify signals in delivering long distance service so that many more users could be served over greater and greater distances and receive better call quality. In 1956, a consent decree signed by AT&T forced them to put the transistor patent into the public domain (in alignment with the earlier objectives of Senator Kilgore) rather than profiting from an invention that was created with "public" money.[12] By breaking the return path whereby inventions might cross-subsidize service delivery, government intervention sowed the seeds for the same decline in creating inventions and innovation it then claimed to reverse in Bayh-Dole. Ironically, Bell Labs intellectual property continues to earn its current owners hundreds of millions of dollars every year, long after the protracted demise of the efficient system that created it. In an interesting side note, during World War II, Western Electric (the manufacturing arm of AT&T) received $130M (1996 dollars) through the Office of Scientific Research and Development while MIT received $886M (1996 dollars).[13] I wonder what the university landscape might look like if regulators had decided to break up MIT!

There is also a behavioral element to how we have come to believe that we can create value from early stage technology, and that the spark of innovation can somehow be coerced. The behavior of children is believed by B. F. Skinner and Behavioral psychologists to be a cumulative response to external and internal stimuli, some of which can be observed, some of which can be abstracted, and some of which is never observed or abstracted (but nonetheless has influenced the behavior of the child). Similarly, the intellectual property macro-environment, inventing behavior, the patent system, and our professional responses as licensing professionals are also strongly influenced by classical conditioning (think Pavlov's canine experiment with stimulus/response), and operant conditioning (modification of behavior by reward and punishment). The way we work and respond to situations in our profession is impacted by each and every case that is heard, every license that is inked, and every successful implementation and dissemination of intellectual property for the greater good. Treble damages, injunctive relief, the work of the ITC, the processes that surround the examination and reexamination of patents, and multi-million dollar settlements or license agreements all drive the behaviors of inventors, infringers, investors, innovators, licensing professionals and myriad other stakeholders throughout the entire continuum of each technology's lifecycle.

Semantically, we all agree that developing, disseminating and implementing science and technology is a good thing, and that promoting "the useful arts" by patenting, licensing, technology transfer, and commercialization will somehow enhance economic development objectives and otherwise benefit society. Beyond this basic (and fuzzy) feeling of general well-being that these words elicit, however, lies a confusingly interchangeable taxonomy which is used to describe elements and influencers of the process involved in and used to achieve unclear objectives. There is no standard way to measure progress at any point in the process, or to measure the impact of the achievement of the goal (should we be so fortunate as to actually have defined one!) We all cringe when we hear invention, innovation, and technology used interchangeably to describe the subject matter of our profession. Each of these terms is distinctly different from the other, and arguably each term exists in a hierarchy that should preclude their interchangeable use. Similarly, technology transfer, technology commercialization, patenting and licensing are often used interchangeably to describe the process of creating value using the invention, innovation, or technology. Perhaps most problematic is that our goals are often unclear as a result of the inappropriate selection of the terms "economic development" or "economic growth" to describe the goal of our work, without recognizing the intermediate requirement for a commercial incentive acting on an interested party to effect this goal. It is our failure to recognize and forge this crucial link in the value chain that is the greatest impediment to realizing the full potential of research and early stage technology.

As a result of these ambiguities, unrealistic expectations, and misaligned behaviors which we have learned, most of our attempts to realize value from early stage research or early stage technology follow

12. Postley, John. "How AT&T Works." *HowStuffWorks.com.* Discovery Communications, n.d. Web. 19 Apr 2010. *http://communication.howstuffworks.com/att4.htm.*

13. Mowery 22 (From Pursell, C. "Science Agencies in World War II: The OSRD and its Challengers." *The Sciences in the American Context: New Perspectives*. Smithsonian Institution Press 1979 P. 364).

the curve of disillusionment or "Hype Cycle,"[14] the phases of which are:

1. The "Technology Trigger." The first phase of the hype cycle, in which a research result, invention, breakthrough, product launch or other event generates significant press and interest.

2. The "Peak of Inflated Expectations." The second phase, in which a frenzy of publicity from phase one typically generates over-enthusiasm and unrealistic expectations. There may be some successful applications of a technology, but there are typically more failures.

3. The "Trough of Disillusionment." The third phase, in which technologies which have failed to meet the unrealistic expectations of the second phase quickly become unfashionable. Consequently, the press usually abandons the topic and the technology.

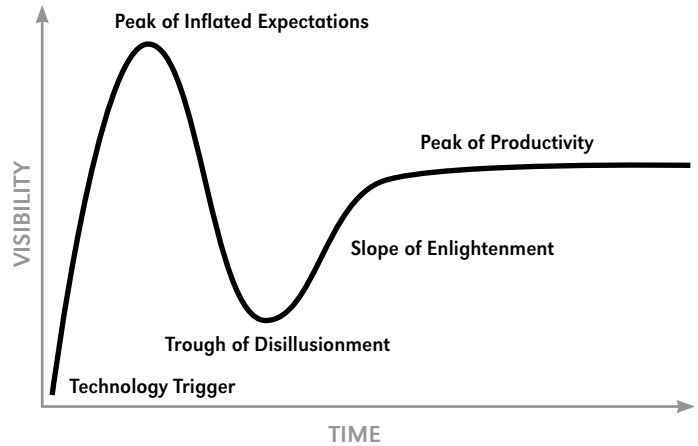
4. The "Slope of Enlightenment." The fourth phase, in which some practitioners continue to experiment, develop and enhance their understanding of the benefits and practical applications of the technology.

5. The "Plateau of Productivity." The fifth and final phase, in which the technology becomes widely demonstrated and accepted. The technology becomes increasingly stable and evolves in second and third generations. The final height of the plateau varies according to whether the technology is broadly applicable or benefits only a niche market.[15]

In our careers, we have all experienced phases one through three in every early stage technology commercialization case study, and yet we continue to persist in our thinking that early is better with respect to achieving big financial results from patenting and licensing early stage technology. This is simply not the case. The role of a patent is to stop others from practicing the invention for a period of time,[16] not to convey knowledge, so it seems like an odd vehicle to use to effect the transfer of technology into the commercial domain and thereby benefit society. Patents do need to teach/enable one skilled in the art, but they stop short of providing the whole recipe, so they are not really suited for technology transfer in and of themselves. A patent is a tool used to defend the market share of a risk-taking investor for a fair period of time required to recoup the development investment and to make a fair profit for taking the risk of innovation based on the invention. The provisions for transferability of patent rights by the inventor to a third party are also a clear indication that it was recognized that this investment might not be made by the inventor.

There is plenty of evidence that indicates that if we can port technology to an innovator, steps four and five will follow, but we consistently adhere to policies and procedures that make it virtually impossible to attract an investor/innovator/market maker. To create value from early stage technology or research results it is important to understand the entire value chain. Vannevar Bush described the end points of this value chain in 1945 when he stated that basic research was the ultimate source of economic growth.[17] But invention, disclosure, patenting and licensing are elements of a process to achieve this economic growth, they are not the goals or even in some cases necessary to achieve it. Michael A. Cohen at UC Berkeley refers to this attitude as a "Licensor-Oriented Mindset" and proposes to supplant it with a "Researcher-Oriented Mindset,"

Figure 1. Hype Cycle



http://en.wikipedia.org/wiki/Hype_cycle

14. The term was coined by Gartner Group analyst Jackie Fenn in a 1995 report titled "When to Leap on the Hype Cycle."

15. Fenn, Jackie. "Hype Cycle." *Wikipedia*. Wikimedia Organization, 3 May 2010. Web. 26 May 2010. *http://en.wikipedia.org/wiki/Hype_cycle.*

16. Article 1, Section 8, Clause 8 of the U.S. Constitution gives Congress the authority to "… promote the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."

17. Bush, Vannevar. Science: *The Endless Frontier*. U.S. Government Printing Office 1945.

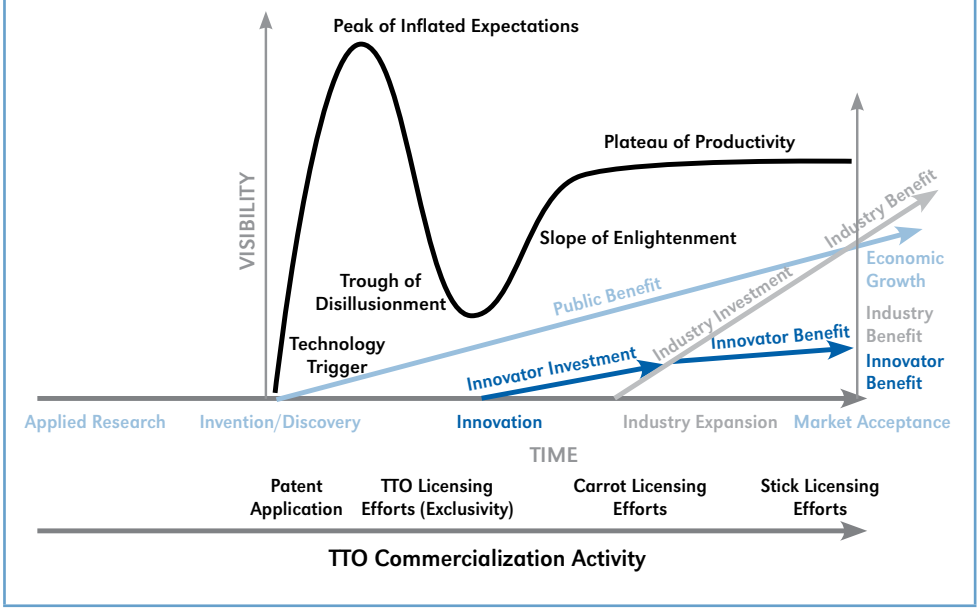
one that is "more inclusive and responsive than the stereotypical, license-oriented IP approach."[18] Niels Reimers, the founding director of Stanford University's Office of Technology Licensing figured this out between 1968 and 1970 when he focused his efforts on understanding the technology and the market applications for it instead of focusing on the management of patents. And yet, decade's later key performance metrics continue to focus on licensing patents to industry as a proxy for university technology transfer success. Steven DenBaars of UCSB, who did work in the field of Gallium Nitride laser and microwave transistors recounted his experience trying to license his work to industry as having met with little success. In defining his objective as technology transfer, he explained (in 2000) that *"…students are the most important resource we have. I'd say they're much more valuable than the patents."*[19]

In the early stages of a technology, it is a fairly common practice to make assumptions and formulate strategies like blind men attempting to describe an elephant in a room.[20] Then, based on these assumptions we try to determine what to do with the elephant. We can disclose the existence of the elephant to the research sponsor, and then quickly try to push the elephant out of the room (where hopefully it will be harnessed and productive and not crush its trainer) in accordance with the provisions of Bayh-Dole, or we can take a more complicated path to try to determine what to do with the elephant to create at the very least some public benefit, but preferably economic growth.

In Figure 2, the elephant in the room is the Invention/Discovery or Technology Trigger of the Hype Cycle. Although a patent on the elephant is virtually un-licensable at this stage it should be attained nonetheless to protect the future market for the acquirer and implementer of the technology underlying (or succeeding) the invention. But if early stage technology development does not benefit from patenting the underlying inventions (as the plenary speaker at the LES meeting opined), why do it? Because, as Wayne Gretzky once said, *"Good players go where the puck is; great ones go where the puck is going to be."* Patents are essential to protect market share and create barriers to entry if and when the technology gets to market and can be reproduced by unlicensed entrants. Creating a patent can also help "containerize" a series of inventions and investments that may subsequently form the basis of someone else's innovation.

Traditional early stage efforts to realize value at this point in time first drive, then are driven by the Expectation Curve, often resulting in ineffective or inappropriate licensing efforts[21] and the ultimate withdrawal of all but a few interested potential market participants.

Figure 2. Typical Early Stage Technology Economic Growth Model



18. Cohen, Michael A. "The Research-Oriented Approach To University IP: A Reinvention Of University IP Management Away From A Focus On Licensing To A Focus On Research." *les Nouvelles*. XLV.2 (2010): 97-102. Print.

19. Mowery 162-165.

20. This parable has been attributed to the Sufis, Jainists, Buddhists and Hindus. It describes how multiple blind men in a room with an elephant attempt to describe the entire animal based on a very local observation (and limited perspective). *http://en.wikipedia.org/wiki/Blind_men_and_an_elephant*.

21. The use of the word "inappropriate" in this context is not meant to indicate malicious intent on the part of the licensor. It is used to describe licenses that may ultimately retard, impede or otherwise reduce the public benefit that might have resulted from the technology.

Figure 2 shows that, although there is a dramatic pullback ultimately ending in the Trough of Disillusionment, the Public Benefit has actually increased as a result of what the remaining potential market participants have learned about the technology and its potential applications during this period. Armed with this knowledge, at least one party needs to combine the *"…technology with market knowledge, leadership, risk taking, financing, manufacturing and more in a new, commercially useful way."*[22] Developing a vehicle that will create the greatest Public Benefit (and possibly Economic Growth) from early stage technology requires Innovation and Innovator Investment to create an alignment of the Innovation with the emerging market opportunity, in return for which the Innovator (and the Innovators investors) should expect to receive some benefit. Richard N. Foster provides a glimpse into the motivational psychology of the investor in Innovation as follows: *"…the Limited earned an average annual return to shareholders of 52 percent for the 15 years after 1974. If you invested $10,000 in 1974, you would have walked away with $4.6 million 15 years later. It was new and it created a lot of wealth, and those are the two determinants of innovation as far as I'm concerned. If it creates a lot of wealth but it isn't new, you wouldn't call it an innovation, and if it's very new but it doesn't create any wealth, then I'm not interested."*[23]

Early stage technology without the potential for Innovator Benefit is not innovation it is still Basic Research; it is an answer looking for a question.[24] At this stage of development, technology transfer and a license to the underlying intellectual property rights may catalyze the efforts of the Innovator and build some of the momentum required to climb the Slope of Enlightenment. However, while it has been my observation that technology transfer can be very easy (leave your lab unlocked and unattended at lunch, and leave your notebooks on a desk near the door), technology transfer in the context of providing a Public Benefit is significantly more difficult. Simply moving the piano from your living room to the stage of your local theater does not inherently create value unless you are able to procure the services of an accomplished pianist. In the case of creating a Public Benefit, the qualifications of the Innovator, access to funding, the agglomeration of ancillary intellectual property, development resources and "the spark" all need to align at the right time and place, and in sufficient quantities to have any hope of hearing more than a performance of the scales by the piano movers.

As the technology proceeds up the Slope of Enlightenment, driven by the Innovator Investment, the Public Benefit increases and the Innovator begins to benefit from his investment. Enlightened owners of intellectual property know that it is usually necessary to grow an industry in order to maximize their own benefit, and to that end they will begin to license to industry partners with greater resources or established distribution channels to accelerate this process. If done correctly, the Innovator Benefit and the Industry Benefit will drive up the Public Benefit until such time as they are both proximate to an intersection with the Plateau of Productivity curve, after which the marginal growth of the Industry Benefit (either through expanding markets or new market entrants) drives Economic Growth. If a sturdy intellectual property protection platform has not been built during the earlier stages of development, however, the Innovator Benefit may be eroded in favor of the Industry Benefit as new entrants to the market bypass the Innovator. Conversely, if the owner of the underlying intellectual property begins to aggressively assert its rights against entrants into the industry, thereby overly restricting the number of industry participants, the Public Benefit curve will remain below the Plateau of Productivity until the expiration (or other termination) of the underlying patent rights, after which the Public Benefit may achieve its full potential, albeit without any additional Economic Growth due to price erosion and the emergence of substitute goods.

Sometimes I like to channel my inner economist and profess to believe in the existence of an efficient market for innovation based on the rational expectations of its participants. After all, we have centuries of examples of successful innovation across a great diversity of technology, better access to information than those who innovated before us, and a communications infrastructure that has all but eliminated the concept of distance. Then I hear another voice (my inner multivariate statistics conscience) that reminds me that behavior is best predicted when you are able to identify ALL of the variables that have an effect

22. De Beers.

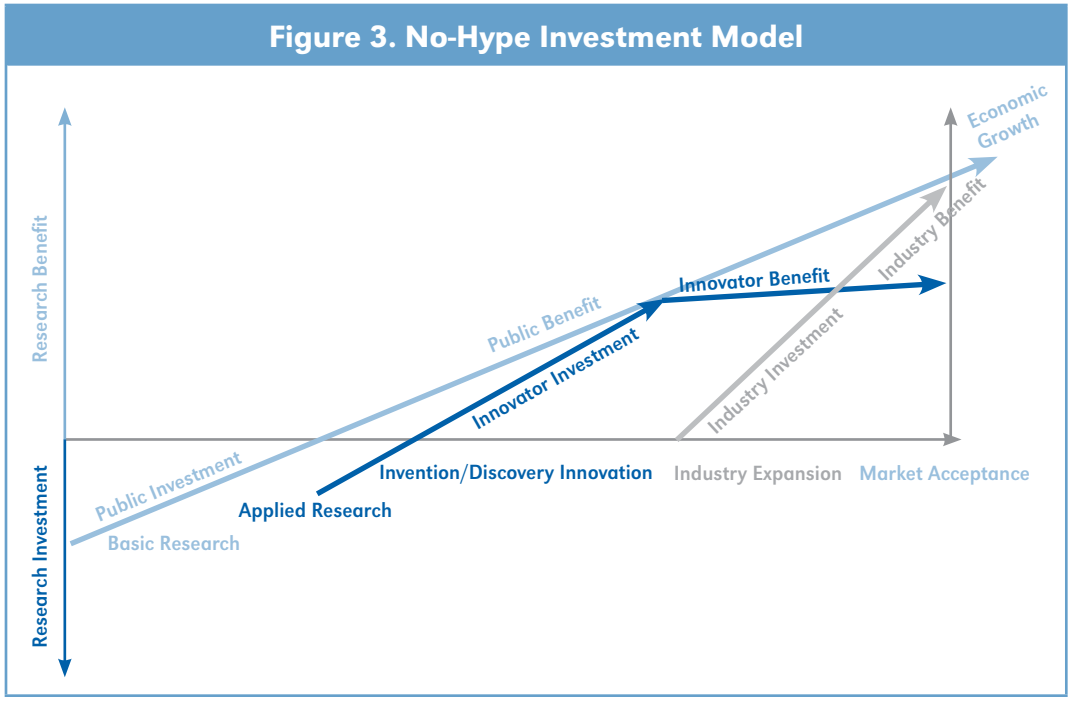
23. Wolfe, Josh. "Richard N. Foster's Innovation Recipe." *Forbes/Wolfe Emerging Tech Report* 15 Feb. 2009: Web. 26 May 2010. *http://www.forbes.com/2009/02/15/innovation-creative-disruption-leadership-clayton-christensen_0215_clayton_christensen.html*.

24. William D. Michalerya, Associate Vice President, Government Relations & Economic Development Lehigh University gave me some great advice in this regard when I first started working with intellectual property at Lehigh University. "Dan," he said, "don't be the guy who turns down a disclosure for cutting grass with fishing line."

on the behavior of the participants in this process. In the case of predicting the behavior of Innovators, if you exclude the influence of non-practicing entities (not just trolls, but other research exempt organizations as well as those government entities (and their beneficiaries) that enjoy a license to practice an invention by virtue of the "march-in" provisions of the Bayh-Dole Act) from the calculation, either the behavior of the Innovator changes, or the result of their behavior becomes less valuable. If non-practicing entities develop, protect and enforce intellectual property rights that compete with or supersede those in the control of the Innovator, then the market value of the Innovators intellectual property will decrease, and some other entity will be enticed (by economic reward) to acquire and assert these rights for economic gain, to the detriment of the Innovators Benefit, Public Benefit, Industry Benefit, and ultimately Economic Growth. This is known as the tragedy of the anticommons,[25] which is a condition resulting from the misaligned objectives of patent holders, each of whom is actually acting rationally in their own self interest. The relationship between Research Corporation and MIT was terminated in 1962 as a result of a fundamental misalignment between the licensing objectives of Research Corporation and the research goals of MIT (and the risk this misalignment created with respect to MIT's research funding by industry research sponsors like IBM.)[26] This conflict persists today in compartmentalized university licensing offices that use financial metrics to evaluate program effectiveness. The Kaufmann foundations "Free Agency" model does little to address this, and may actually exacerbate it by adding one additional layer of parochial interest.

Perhaps an "Innovation Agency" model might be a better approach to the development of collaborative cohorts that would then be better aligned to maximize the Public Benefit from Basic Research. I would propose that Public Investment should be restricted (in peacetime) to Basic Research. Applied Research should be funded by Industry, and Inventions/Discoveries arising from this Applied Research can be developed by funding from the Innovator.[27] Assigning the Invention/Discovery to the Innovator would effect the benefit that the patent system was designed to provide; creating an incentive on the part of the Innovator to assume the risk, cost and trouble to take an invention to market and create a Public Benefit. Figure 3 illustrates this approach.

Figure 3. No-Hype Investment Model



25. This term was coined by Michael A. Heller, when he was the Assistant Professor of Law at the University of Michigan Law School.

26. Mowery 72.

27. This can be by "right of first refusal" so that in the event that Industry does not choose to protect the invention, the right to do so will vest in the Research partner.

This approach is different than the model that served this country until the 1990's. The United States did not start with a blank slate with respect to technology. Metallurgy, agriculture and other art and science was already in place and widely practiced by the indigenous populations, and additional inventions were subsequently imported (arguably by the misappropriation of intellectual property) by some of the original and later immigrants to this country. Mowery and Reichmann observe that our university system and its research activities developed in alignment with the needs of proximate populations, creating a unique basic, yet applied approach to discovery and development, teaching, researching and inventing in response to local economic, industrial and agrarian micro-environments. Unlike academic institutions in other parts of the world, "U.S. universities…were not primarily training graduates for governmental service."[28] They were unique in the efficiency with which they transferred their research results to industry by publishing these results and disseminating graduates into industry that would be skilled in these arts. Aligned with these academic institutions were the greatest industrial innovators of all ages in the form of companies like AT&T (Bell Labs), RCA (RCA Labs), Xerox (Parc), and IBM. These companies directly funded Basic Research (and the facilities and equipment required to do so.) Pressure from the financial markets, however, forced these companies to optimize their financial performance for a much shorter time horizon, resulting in the elimination of this activity in its entirety by the close of the century.

If we must focus on a tool to use to grow our economies, then, it stands to reason that we should select logistics rather than patenting. If we can apply the right amount of funding to the appropriately incentivized individual or organization during each specific phase of the development cycle, we will accomplish our goals of maximizing Public Benefit, Industry Benefit, Innovator Benefit, and Economic Growth. Government funding historically went to government agencies (DARPA, NASA, NIH, NSF, DOD, DOE, USDA) that then funded their research agenda in select academic institutions. Federally funded academic research grew from 24 percent of total academic R&D in 1935 to 58 percent in 2000.[29] During this period the majority of the funding was from the DOD and NIH. Today there is virtually no Basic Research (relative to the previous century) and arguably much of this shift to Applied Research may have been the unintended result of the Bayh-Dole focus on patenting and licensing.[30] To restart the practice of Basic Research, we need the sponsorship of a government entity with a long time horizon (at least 20 years or more) and a Public Benefit/Economic Growth agenda. Funding for Applied Research on select results of the aforementioned Basic Research will naturally transition to a sponsor with a shorter horizon (5 years) and a more fully formed problem statement or hypothesis. This is most likely our Innovator. From Applied Research will issue Inventions and Discoveries that will be protected in the name of the Innovator, and from this the Innovator will license to other Industry Investors that are better able to accelerate the roll-out of the Innovation by virtue of their existing market channels or manufacturing capabilities. The Innovators Benefit will combine with the Industry Benefit to raise the Public Benefit, and when the Innovation is accepted, implemented or becomes a standard practice, Economic Growth will result. As long as the Innovator does not seek to restrict the Industry Benefit in order to augment the Innovator Benefit, the potential sum of benefits will approach the theoretical maximum benefit the Innovation is capable of generating. ■

28. Reichmann 2.

29. Mowery 24.

30. Kanarfogel, David A. "Rectifying The Missing Costs Of University Patent Practices: Addressing Bayh-Dole Criticisms Through Faculty Involvement." *Cardozo Arts and Entertainment Law Journal*. 27.2 (2009): 533-554. Print.