

# CHAPTER

## Challenges in University- Industry Collaborations

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### INTRODUCTION

During the past decade, much has changed in the way people interact. The emergence of a pervasive, global communications infrastructure has made it both possible and convenient to engage in conversation and dialogue with others at the furthest corners of the earth. Human knowledge continues to advance and doubles at a rate of every seven years. And social problems also seem to grow in scope and complexity, evidencing whole new categories of issues that continually challenge the accumulated wisdom and the infrastructure and capabilities that have been developed throughout the modern world.

These forces have also visited upon the industry and university sectors. In the past ten years, industry has been subjected to very significant challenges and shifts in its operating paradigms as it has attempted to bring new innovative products and services to market, to provide employment and growth for its employees, and deliver value to its shareowners. In this time period an entire "era" has come and gone (the dot-com rise and, subsequently, the bubble burst), and many of the hard-earned lessons learned from these types of ventures have already been put to work in the new business models that are part of the ongoing march of progress. Universities too have experienced their own challenges and changes as they work to get ahead of world evolution, and to provide the insight, thought leadership and research that can point the way

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into a compelling, opportunity-filled, more promising future than the one humankind has experienced so far.

The efforts of Vannevar Bush (Bush, 1945), the national focus on science and technological advancement, a relatively abundant investment strategy, and the set of initiatives that were created by government over the past five decades, created an impressive, extended renaissance of unparalleled technological development, significant contributions to society, advancement of knowledge, a thriving environment for companies and economic prosperity for the nation. It provided us with the foundation for a virtuous partnership-based ecosystem between universities, industry and government.

This arrangement seemed to have stood the test of time, until very recently. Cracks have begun to emerge in this foundation, and it now appears that future success and accomplishment can no longer be assured, given the challenges and shifts we are witnessing in these present spaces. It's somewhat ironic that while recent infrastructure developments have enabled us to collaborate and engage with each other more easily than at any other time in history, changes in our thinking, attitudes, beliefs and motivations have simultaneously placed obstacles in the way that have to be overcome.

## THE COLLABORATIVE FUTURE

Researchers throughout the world are more and more discovering like-minded colleagues who are interested in their work, and who can add to it and advance it through unique insights and contributions. Companies now realize that products and services are not delivered to customers in isolation, but rather through the richness of an ecosystem of players who add value beyond what was imagined in the original product concept. Governments are interacting more with each other as they work to address present needs and link the efforts of others into their new planned initiatives and programmes. The first expression of interconnection and engagement is well underway as people recognize the opportunity to be harvested from engaging with others of like kind in distant corners of the globe, with whom they can naturally and easily synergize perspectives, problems and plans.

The second development in interaction and engagement is not so far along. How does one engage with different and diverse-minded individuals, organizations and institutions across the globe? What happens when people and systems come together that hold different philosophies, value systems, beliefs, and criteria? How can they productively engage with and collaborate with each other in interesting and virtuous ways in order to discover additional insight and contribution beyond what was previously possible? How can academia, for example, engage on a broad scale with industry? How can governments utilize and link with these two societal resources to accomplish great things? How can all three

come together in significant ways and complex arrangements in order to meet some of the challenges that are faced by all of humankind?

Collaborative engagement will be the norm in the knowledge and information exchange wave (Johnson, this book). Industry brings to such collaborations the understanding of how research advances can be applied and provides inspiration to the university researchers' quest for fundamental understanding (Stokes, 1997). Yet we have not figured out all the ways of successfully and easily collaborating on a broad scale. In order to understand this area, we will now examine some recent developments in the university-industry relationship space, with government as a backdrop to that work. We will explore some of the factors and forces motivating the shifts and changes in each of these areas with a view to understanding some of the unhealthy overlaps that have been created as a result.

## **ECOSYSTEM TRANSFORMATION**

There are three broad categories of factors and forces contributing to the transformation that we are experiencing in the university-industry relationship space. These will be discussed in the following sections, from the perspective of those affecting —

- University mission, context, and environment;
- Industry mission, context, and environment;
- Government purpose, directions, and agendas.

### **Factors & Forces Affecting University Mission, Context and Environment**

A number of factors and forces contribute to the university community's motivations, directions, operating parameters and ongoing ability to successfully navigate the road ahead. Some of the ones relevant to our discussion around collaboration are:

- Building and equipment asset bases continue to age, and are in need of renewal, upgrade, replacement and/or revitalization;
- Governments, both federal and state, continue to reduce funding in science and technology, particularly in the physical sciences area;
- The rise in entrepreneurial successes and the dot-com era create expectations of large paybacks from brilliant "new ideas". Much of the focus is drawn to what is possible, and little attention is given to the large number of company failures that don't materialize success;
- Professors and small research teams gain increased motivation to build start-up companies in order to profit from their new ideas;

- Bayh-Dole legislation is passed, and its interpretation leads to an increased desire in controlling who gets the rights to commercialize technology;
- The “get rich” archetype gains momentum from a small number of impressive data-points (both universities and research teams);
- Universities (as institutions) are encouraged and asked to participate in economic development outcomes by local and regional government interests;
- Focus and emphasis shift from educating students and dissemination of early-stage knowledge and information, to research, revenue generation through Intellectual Property (“IP”) licensing, and downstream control of commercialization rights and parameters.

### **Factors & Forces Affecting Industry Purpose, Context and Environment**

A number of forces and factors contribute to industry’s motivations, directions, operating parameters and ongoing ability to sustain themselves into the future. Some of the ones relevant to our discussion around collaboration are:

- Companies are forced to blend new business models with “brick-&-mortar” operations, as they struggle with their internet presences and value delivery systems;
- Dot-com bubble gains momentum, then bursts;
- The internet takes root as the information infrastructure of choice, and activities accelerate (in both durations and timeframes) as information moves freely and easily between companies and across international borders (Friedman, 2005);
- Business becomes more “real-time” in almost every dimension;
- The increased competitiveness and real-time information flows erode margins and shorten product lifetimes, thereby putting downward pressure on goods and services pricing;
- Disintermediation becomes the norm, as companies rewrite the rules of their distribution and value delivery networks;
- Globalization grows and continues to accelerate, as companies move more and more jobs (and job categories) to capable, lower cost economies (Friedman, 2005);
- Consolidation, cutting costs and the lowering expense structures become the order of the day;
- In the absence of strategic relationship interests and outcomes, funding to universities decreases (considered philanthropy);
- The newest emerging paradigm requires companies to excel at both innovation and reducing costs simultaneously. Previously, these two

situations were perceived to be in conflict, and a single organization was either clearly in a growth/investment mode, or clearly in a consolidation mode.

### **Factors & Forces Affecting Government Purpose, Directions and Agendas**

A number of forces and factors contribute to governmental motivations, directions, operating parameters and ongoing ability to create sustainable environments. Some of the ones relevant to our discussion around collaboration are:

- Government continues to struggle with high spending deficits, due to a variety of factors;
- Reductions in science and technology investment are offset by increased focus on bio-tech, pharma and homeland security;
- Recession takes place (2000-2003), recovery is slow, and economists disagree as to whether latest numbers show growth and recovery, or “stag-flation”;
- Economic development becomes a motivating factor in many government actions and decisions, at the federal, state and local levels;
- Loss of jobs (globalization, offshoring) becomes both a regional and national focus;
- The U.S. struggles to return to virtuous environment it has enjoyed in past.

### **A Confluence of Factors Creates “The Perfect Storm”**

During the past decade, cracks have begun to emerge in what used to be a solid virtuous relationship foundation between American universities and industry. Revenue shortfalls, reductions in funding from all sources, changes in legislation, global competition and many of the factors discussed earlier have caused both companies and universities to intensify their focus on revenue generation, cost cutting and accomplishing more with less. This has precipitated an unhealthy overlap of interests in the commercialization space that had not been experienced previously on a broad scale, and left these partners of many decades puzzled and confused as they try to figure out what has been happening to the overall system. Some of the symptoms of this troubling situation are:

- Universities increase focus on downstream commercialization through IP patenting and licensing as a vehicle to enhance revenue;
- Universities increase their role in economic development under pressure from various governmental interests;

- Companies increase focus, consolidate activities, execute cost-cutting strategies and increase efficiencies in order to deal with the competitive forces and pressure on cost-structures;
- Companies participate in globalization and increase offshoring activity in an attempt to cut costs and preserve competitiveness, be sustainable and maintain healthy levels of profitability;
- Patent trolling becomes more pervasive, as many players (both companies and universities) attempt to extract revenue from the successful commercialization of technology after the investments have been made and the risks overcome.

The net effect of all this is that many more players are now attempting to occupy positions within the same space, with overlapping interests, while trying to work together more intimately and more intensely than ever before:

- The commercialization space becomes very crowded as many more companies enter the fray due to internet-enabled global competition;
- New categories of players (universities), who before had focused much of their interests on early-stage research, have become interested in participating in the commercialization space, as a vehicle to generate revenue;
- Intellectual property (IP) patenting and licensing issues become a major barrier in the ability to negotiate joint research contexts and gain agreement on collaborative research efforts, joint ventures, cooperative R & D, and a host of other mutually beneficial arrangements.

## THE EMERGENCE OF 'IP' AS A LOCUS OF DIFFICULTY

After some reflection and examination of the situation, one question continues to persist: "How is it that universities and companies are recently experiencing great difficulty in working with each other, while company-to-company relationships haven't seemed to have suffered from the same problems, over this same time period?"

Companies, despite their drive for growth and their competitive nature, for the most part have developed reasonably successful models for working together over the decades. Perhaps it's the many years of failed experiences, the talented staffs and the savvy business managers who were developed through these experiences that enable the situation. Perhaps it's the commonality of the shared value system. In any event, there exists a rich set of models and relationship structures, together with a body of knowledge and expertise, by which one company can engage with another, even when the two are in direct competition. To list a few of these inter-company engagement models there are technology exchanges, joint developments, contracted system —

sub-system developments, procurement relationships, those who may develop testbeds and prototypes, companies who will perform services for each other (such as testing, verification, quality assurance, etc.), and many, many more.

### **Concrete Outcomes vs. 'Delayed Binding'**

When the range of these inter-company engagement structures were examined, they all seemed to have one thing in common — they were founded on an exchange of something *tangible and concrete*. The outcome and the reason “why” two companies were working together was known at the onset of the relationship development activity, and the object(s) of exchange were specific, known and able to be negotiated in a tangible way. For example, some of the types of outcomes and exchanges on which companies can work together are — acquiring software or hardware from one another, executing a joint product development, acquiring technology, procuring a completed component, sub-system or system, contracting for a product element or an entire product to be developed, securing a prototype or testbed which embodies a particular concept or capability, instantiating an algorithm, conducting a simulation, building a model, producing an analysis or report of some system element, and so on.

When the array of successful inter-company engagements was further examined, it was determined that many of the process models were developed first around the exchange of *tangible outcomes*, and then the secondary discussion could take place around who gets to own it, who pays for it, who gets to replicate or leverage it, who gets to license or sub-license it, etc. The point is that the “it” was known and mutually understood, before all of the ownership structures around the “it” were dealt with. The object(s) of the exchange set a direction and context for all of the other conversations to take place. And the negotiations around ownership were anchored in an understanding of what specifically was being considered as the object of the partnership arrangement or relationship structure.

When looked at the company-university interactions, the situation was quite different. “IP” was talked about as if it were a tangible object. Yet there seemed to be little precise understanding of what the “it” — the output of the collaboration — was. At the onset of the interaction, the intent was to create a joint research context, to collaborate in some area of mutual interest, and IP was a *proxy* for something to be determined in the future, which presumably had value. This deferral of reference or “delayed binding” made the ownership and licensing discussions intangible and indirect, and an order of magnitude more complex. The fact that we were even discussing the ownership rights to something that might be created in future is rather ethereal. Since it was neither guaranteed that IP would necessarily be created, nor was it assured that it

would have a value that both sides could agree on (if it had any value at all), agreements as to what value transfer should occur to which party, also became difficult to converge. Couple this with the fact that some parts of the law require that the fair-market-value of the IP not be determined or given away “up-front” (essentially before it is created), and we have all the forces necessary in the system to provide for a very complex negotiation of arrangements.

Furthermore, once having begun the IP negotiations, the issues seemed to take on a life of their own as teams of people from each side attempted to plan for and negotiate every eventuality, “in case” something valuable might come out of the joint collaborative activity. The discussions very quickly became hypothetical, ungrounded, and oriented around the *ownership rights* of something, as well as around *responsibility for* and *risk avoidance of* it, should the “it” become problematic. Many of these “IP” discussions became focused further up the food chain, closer to the ideas and concepts development, instead of being focused further down the food chain, closer to implementation. The negotiations also seemed to take on an emotional aspect, as the participants became very attached to their own ideas and the perception of an over-estimated value that they might have later. If we contrast this with the typical “matter of fact” business negotiations that usually take place around specific deliverables in most inter-company negotiations, it is easy to understand why the negotiations stall and become difficult to converge.

### **Model Differences and ‘Intent’**

Yet there was still something deeper going on throughout these interactions. There was a difference in how each partner approached the area of “intent”. Universities were negotiating, not with an intent to commercialize their work (as most companies do in typical inter-company technology exchanges), but with a view to who should hold the rights to commercialize the work and which other players may be blocked from doing so. This is not a situation in which there are equal players with a common intent to move forward (as there are in many inter-company negotiations.) This situation is more like a model in which there’s a late “assert play” involving payment for the continued rights to be able to ship product. Because of the inherent inequality of partners, and the difference in their intents (one is trying to move forward with something, the other is trying to receive compensation for not blocking it), these conversations inherently contain the seeds of distrust.

The underlying difference of intents, together with the undercurrents of distrust that are embedded therein, represent a somewhat contaminated model. They cause what would otherwise be a rational conversation between two potential partners to encounter difficulty rather quickly, and either end in difficulty or not converge to conclusion. At the root of it is both a slightly



contaminated and somewhat contemptuous model — “We’re not able to commercialize this, but if any of our *ideas* are contained therein, we will assert control over which parties get which rights to use it, and which parties will be blocked in their attempts to do the same.” The conversation thus necessarily involves blocking positions and negative future potential, instead of two partners moving forward together in a useful way. In the negotiations phase, it’s not a win-win situation that is being worked toward, but a compromise at best, and some might even liken it as being similar to “bad faith” negotiations. Even when the IP negotiations are successful, frequently none of the participants like the outcome or feel that it was a win, worthy of their time and attention.

### Criteria and Value Systems

An important set of criteria that companies optimize around is *design freedom*. Companies need to have, as much as possible, the freedom and ability to commercialize their ideas and concepts in order to survive, to be sustainable, to provide employment, and to provide value to their customers and to society. They will naturally move away from any relationship or partnership structure that seeks to limit or erode design freedom in their current or future product development efforts. They must do this as a matter of survival.

Furthermore, companies know how to preserve design freedom in a competitive arena. The rules of competitive engagement have been around for decades, are supported by law, and provide both restrictions and remedies for “anti-competitive” behaviour, all the while supporting a system which seeks to provide a mostly level playing field for new and established entrants, and all who participate.

Universities, on the other hand, optimize around *academic freedom and open inquiry* in the context of their education mission. They will naturally tend to avoid any attempts to limit their thinking or be constrained in the areas they investigate, as they conduct their research and educate students in the pursuit of their academic mission.

These two value systems are usually compatible with each other when universities pursue early-stage, pre-competitive research interests, and companies focus their time and efforts in the later-stage commercialization and application of technology to problems and opportunities of interest. Of late, these two philosophies and value systems have been made to intersect in the commercialization space, as the focus and intensity of IP negotiation around ownership and licensing rights have been taken to an all-time high.

At this time, we haven’t yet developed the necessary knowledge and experience to successfully blend the preservation of design freedom, with the desire for open inquiry, in the commercialization space. The symptoms of this become apparent when trying to conclude IP negotiations while setting up a

collaborative arrangement in an area of interest. The challenges and frustrations that many people experience in this negotiation process are simply not worthy of the time and effort expended.

## Cross-Licensing & Technology Transfer

An interesting aspect of the inter-company engagement model is around patent cross-licensing. Consider, for example, that many large companies in the IT space have broad cross-licensing arrangements with each other, *even including their competitors*. They know that sooner or later, deep down inside their large organizations, some ambitious groups will spring up, who will want to exact a pound of flesh from a competitor who is on the way to market with a product that they can block or assert rights over.

Senior organizational leaders know that this is bound to happen in a competitive space. They know that a common failure mode of high-level strategy is to be focused on competitors, and to lose track of the customers, innovation and of value creation. Accordingly, they will usually want to have most of their company's efforts focused on creating value for customers, and they will optimize their internal systems to do so. They accomplish this by setting policy which makes product rights and claims "trolling" a non-opportunity from the outset. Rather than investing large amounts of negative energy blocking each others products from getting to market, companies usually favour some form of broad cross-licensing arrangement. Implicitly, they want the competitive arena to be the marketplace, where value is delivered to customers, and not based upon who has the best attorneys or who can synthesize the best blocking positions from their past work efforts through their current patent portfolio. Simply stated, they want the focus to be in the right area to ensure the long-term survival and competitive advantage of the company. Notwithstanding the discussion of assert rights and patent trolls, long-term successful companies are not built by extracting payment from others *détente* in blocking their efforts to bring products to market.

Companies also do not view patents and licensing as the vehicles of technology transfer. Technology access and transfer are treated as a separate business activity, worthy of first-class attention and focus. Their preference is also not to "buy" patents from each other, but to trade them within an overall cross-licensing strategy. If there are significant differences in the value of each portfolio, then some compensation will usually change hands. But the cross-licensing strategy is more like an "ante" — something that others must have to play in the game. As this strategy builds out, other companies are then encouraged to show up with "roughly equivalent patent portfolios" in order to play in the space.

Universities view this quite differently. They believe that "patents" are indicators of a technology that is "sitting on the shelf", ready to be sold, trans-

ferred and used. They see these licensable ideas as highly valuable, and will withhold use rights depending on how many companies may be interested in the work. From their point of view, the more companies that are interested, the higher the value of the ideas must be.

Yet companies know that these technologies which are being offered for licensing are not working, maintained and operable somewhere within the university environment. At best, there may be demonstration vehicles and prototypes for the concepts embodied; a jumble of lab equipment that works well in controlled experiments may or may not translate to a reliable, affordable product (Mitchell, 2005). In contrast, when two companies are engaging in significant and substantial technology transfer, those technologies have usually been reduced to practice and used across a variety of products. There are people, resources, equipment, processes and competencies associated with them. When they are transferred or otherwise made available, the receiving company (licensee) is usually provided access to this entire range of assets for use in applying the technologies to commercial applications. Companies see the value of technology acquisition and transfer as being quite independent of patents. While they will trade patents as bargaining chips, they will invest substantial time, human capital and equipment in making a technology transfer real with another industrial partner.

## CONCLUSION

Given these inherent philosophical, value and model differences, it's not surprising that companies and universities experience difficulty in concluding IP agreements around the commercialization of ideas and concepts, in the course of trying to work together collaboratively. If the difficulty were just limited to one area, the situation would not be so worrisome. Unfortunately, a single IP negotiation turned sour between a company and a university usually damages the relationship, and has lasting effects that carry over to other areas of interaction.

At the present time, we are caught in the middle of a grand "sticking point" — possibly an inflection or transition to greater opportunity. The future holds significant promise for those who can collaborate and work with others to advance concepts and ideas. However, the area of sponsored research agreements brings industry and universities unnaturally together, in a space for which there is not yet a body of practice and experience for how to work successfully with each other. The proxy for the yet-to-be-determined solution set is the IP negotiations surrounding the collaboration.

How does one resolve the two different energies — the desire to move forward with the intent to commercialize, and the intent to protect and dole out "rights" in order to extract maximum value? How can a company and an insti-

tution have a “good relationship” at one level, when their organizations are in conflict over blocking IP positions? The researchers desire to work together and collaborate. The institutions and companies want to have good relationships and to be members of an innovation ecosystem that works well, with government, for the benefit to society and for the greater good. These model differences represent uncharted territory that we are presently grappling with. Perhaps a good first step is to recognize this, gain additional perspective and understand the situation from the higher level of philosophical orientation, values and criteria.

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