Industrially Sponsored University Research in Information Technology: Some Recommendations Regarding Intellectual Property Agreements

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1 Background

The Computing Research Association (CRA) annually sponsors a conference at Snowbird, Utah, for the chairs of computer science departments and industrial partners. In 2001, it was decided to form a committee to study the production of model agreements for industrially sponsored university research (typically referred to as industrial-university sponsored research agreements, or SRAs). The primary motivation was to reduce the time and effort spent in negotiating such agreements. The committee was to pay particular attention to the disposition of intellectual property (IP) generated by such sponsored research. IP issues are often stumbling blocks in the negotiation. In addition, because of the focus of CRA, only CS/ECE IP, as opposed to say, pharmaceutical IP or agricultural IP, is relevant.

I am co-chair of the committee, along with Gabby Silberman, of IBM Yorktown. This document represents opinions formed on the basis reading (including the bibliography of this memo) and several dozen interviews with university researchers, industrial sponsors, OTL directors and officers, IP lawyers, and others.

This report is a work-in-progress. The opinions expressed here are my own, and are not necessarily those of my co-chair, the CRA, or the University of Texas at Austin.

2 Model Agreements

A model agreement is not an effective way to change the negotiating positions of the parties. In Chapter 4 of [4] (page 49), it is written:

> Model agreements are another approached used to speed the negotiation process. These agreements are challenging to develop and implement because business practices in different industry sectors demand disparate agreements, and because different companies in the same industry, and even different division within those companies, may present opposing views about how a collaboration should be structured and used. In addition, the sheer number of complex provisions in even simple collaboration contracts makes finding common ground extremely difficult. ...
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> Over the years, many partners have attempted to develop model agreements. One of the first was an eight-page report prepared jointly in 1988 by the Government-University-Industry Research Roundtable and the Industrial Research Institute, called *Simplified and Standardized*

institution	license income	research expenditures	income as percentage of expenditures
Columbia	89	279	31.9
University of California system	74	1,865	4.0
Florida State University	57	133	43.2
Yale	41	316	12.9
University of Washington	28	480	5.8
Stanford	28	417	6.6
Michigan State University	24	208	11.4
University of Florida	22	280	7.7
University of Wisconsin-Madison	18	422	4.3
MIT	16	726	2.2

Figure 1: top university license income in millions of dollars

Model Agreements for University-Industry Cooperative Research. Neither it nor any of the other efforts have succeeded in fostering a widely effective model agreement.

SRAs are complex for good reason, having to do with the legal and bureaucratic landscapes in which both industry and the university operate. Standards differ from state to state, between private and public institutions, and within corporate cultures even within the same industry.

Contributory to the problem is that SRAs are typically negotiated on the university side by the same organization and people that negotiate federal research contracts, typically the university's Office of Sponsored Projects, or OSP. But federal contracting and IP arrangements and time-scales are fundamentally different than industrial contracting. This can lead to costly negotiating mistakes by OSPs.

In contrast, a university's Office of Technology Licensing or OTL typically deals extensively with industrial contracting pertaining to patent applications and the negotiation of license agreements. This gives the OTL a better understanding of industrial priorities and realities. The director of the OTL at one of the top-10 CS universities told me that his office was often called in by their OSP to help straighten out contracting obstacles. But, according to him, they were typically involved only after months of delay and misunderstanding that left both parties distrustful and frustrated. "Nothing slows discussions, or raises frustration levels, more than having an inexperienced negotiator who tried to insert unrealistic provisions into an agreement." [4] (page 47).

Stanford addresses this problem directly: Their OSP negotiates government SRAs and their OTL negotiates industrial SRAs.

Recommendation 1: University OSPs and OTLs should work together from the beginning of an industrial SRA negotiation.

3 The IP Goldmine

Figure 1 shows the most productive U.S. universities as measured by license income on IP [2].

But this chart tells only part of the story. What technologies are responsible for this windfall? Biomedical and agricultural products account for the vast majority of these profits.

At Columbia in 1995, the top 5 earners among the licenses generated 94% of the total licensing income and 91% of the income generated by those top 5 were generated by biomedical licenses [5]. In the UC system in 1995, 66% of all license income was generated by the top 5 licenses: all of the top 5 were biomedical. (More recent data, from 2001, indicate that the top 25 licenses generated 77% of the income and that none were CS/ECE inventions [1].) At Stanford in 1995, the top 5 licenses generated 85% of the income and 97%

of that was biomedical. Among the most important technologies discussed are gene splicing, human growth hormone, cancer fighting drugs, and agricultural products.

The predominance of biomedical and agricultural technologies is evident in part simply from the universities listed. Despite their preeminence in CS, Stanford and MIT are not top-ranked in Figure 1. UC is highly ranked but other data [1] indicate that UC Berkeley, the CS powerhouse in the UC system, contributed less than 10% of the total license revenue of the UC system. CMU, the other top-4 CS university, is not present in Figure 1.

Furthermore, successful generation of license revenue requires vigorous patenting and defense. This costs money. According to [3] (page 13) the "typical" infringement suit costs $1–$3M and lasts about 31 months, "meaning that the validity of key 'foundational' patents in software or business methods, those on which subsequent inventors may rely (and for which they are either paying royalties or risking costly infringement penalties), may take years to be established. In fields that are evolving as rapidly as software, such delays could contribute to high uncertainty, high transaction costs, and impediments to innovation."

To put this in perspective, the UC system reported approximately $73 million[1] in license income in 2001. But after subtracting out legal expenses, operating expenses, distributions to joint holders, distributions to inventors, and other costs, the reported net income s $5.2 million [1].

Blockbuster patents, such as that for gene splicing or taxol, are rare in CS/ECE. There are several reasons:

- time-to-market is critical in the computing industry, so lengthy license negotiation can kill the utility of an idea;
- most consumer products involve the combined use of hundreds, if not thousands, of patented ideas; and
- CS/ECE IP protection is relatively easy to skirt and is therefore difficult and expensive to protect.

4 University v Industry Patenting

Universities account for less than 2% of the software patents issued in the United States. This is less than the 3.6% share of overall patents accounted for by U.S. universities. During the 1990s university software patenting declined slightly [3].

Because of the absence of blockbuster patents, companies build interlocking patent portfolios containing thousands of patents. In 1997, IBM obtained 1166 software patents.

These portfolios are used both "offensively" (to force others to pay royalties in order to build products) and "defensively" (to prevent others from blocking the company's products with IP barriers).

Universities have no defensive use of patents: they have no product to defend. Therefore, a university's CS/ECE IP portfolio must be used entirely offensively to have value.

5 Industrial Response to CS/ECE IP Barriers

Three other aspect of CS/ECE research bears noting here.

- The startup costs of a computing company or lab is small compared to, say, a medical center or state-of-the-art biotech research lab.
- Faculty consulting is necessary to maintain currency in computing research.
- Graduate students can earn much more in the computing industry as interns than as TAs or RAs.

[1] The one million dollar discrepancy with the data in Figure 1 is unexplained but the numbers come from different sources.

institution	SRA income	license income as a percentage of total SRA income
CMU	167,675,342	2.8
MIT	725,600,000	1.7
Stanford	417,037,000	6.2
UC system	1,864,901,000	3.7

Figure 2: License Income as a Percentage of SRA Income

These facts combine to give industry a relatively cheap way to control the IP generated by their research funding: set up off campus research facilities and hire CS faculty and graduate students to work in them. Virtually all computing companies now make extensive use of both consulting and interns, in part because it simplifies the IP issues: the companies own the IP. Furthermore, the universities are cut out of the deal.

I predict that this trend will accelerate if universities delay contract negotiations over IP issues or insist on onerous barriers to the use of IP generated by industrial SRAs.

6 The Importance of Sponsored Research

We have collected data on the relative importance sponsored research funding compared to license income. Data broken out specifically for computing-related research was unavailable. So we have confined ourselves to data for the top-4 universities in computer science but collected the data for all research at those institutions. The results are shown in Figure 2. The total SRA income includes both government and industrial SRAs. Generally speaking, government contracts account for about 66% of the SRA income below.

When one recalls the relatively low proportion of license income attributable to CS, the importance of sponsored research funding is even more apparent. SRA income is absolutely crucial to university research and especially to CS research.

Industrially sponsored research (as opposed to government sponsored research) is of particular importance to computer science both because industry has the data we need to work on the right problems and industry is the most direct way our research can have impact. Furthermore, industrially sponsored research is correlated with the economic prosperity of the region around a university:

> Metropolitan areas that have academic institutions performing large amounts of R&D, particularly R&D that is funded by industry, are more able to attract and grow technology companies. [6].

7 Further Supporting Evidence

According to the Director of the UC Berkeley OTL, UC Berkeley has never issued a license to IBM, HP, or Intel [private communication]. A similar statement holds for Stanford, according to the Director of the Stanford OTL [private communication]. The Stanford situation changed recently after Stanford adopted the Epic Program about two years ago. The Epic Program combines into a single portfolio all of the IP generated by the CS/ECE/EE faculty. For a fixed annual dues, a company may join the "club" and be permitted, for another fixed fee, to purchase a non-exclusive royalty-free license on any patent in the portfolio. Companies not in the "club" must negotiate for such licenses. The attraction to being in the "club" is that the license can be obtained essentially automatically for a predictable price and in a short amount of time. So far, two companies have joined the club. (See http://availtech.stanford.edu/Scripts/otl.cgi/epicsummary.)

The UC system has adopted a different approach to CS/ECE IP. In August, 2000, the Office of the President of the UC system announced the Pilot Program. This program essentially excepts CS/ECE IP from the usual licensing policies of the system and authorizes individual contract and grant officers great flexibility, even to the extent of granting royalty-free exclusive licenses to university IP generated under an SRA.

> Recently PEAC (President's Engineering Advisory Council) reviewed the matter of how engineering industry sponsors access University intellectual property resulting from extramural sponsored research. It was observed that the rapid rate of technological change in the engineering fields of electronics, communications technology, [and] computer hardware and software results in new products with a typical lifetime of a few years or less. Competitive success rarely is based upon the statutory protection of intellectual property as requirements for conformance with industry-wide standards reduce the value of proprietary technology. Rapid product development and early market entry with innovative products are the keys to market leadership and successful products.

In private conversations with both administrators and faculty members, I was told that the expectation is that successful companies exploiting UC Berkeley IP repay the university's generosity with gifts and fund raising campaigns whose value far outweighs the likely license income.

In the conclusion of [5] the authors write:

> A recent survey of firms in the manufacturing sector indicates that the four most important channels through which firms benefit from university research are publications, conferences, informal information channels, and consulting. Even in pharmaceuticals, where patents and licenses are more important than in other industries, firms rely heavily on these other channels of knowledge and technology transfer.
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> ...
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> First, widespread patenting and restrictive licensing terms may in some cases hamper, rather than promote, technology transfer from universities to industry. These policies may also obstruct the process of scientific research. Second, an administrative emphasis on patenting and licensing may interfere with the operation of other effective channels through which university inventions reach commercial applications.

8 Exclusive versus Non-Exclusive Rights

According to [5], a relatively high fraction of all inventions licensed by universities are licensed under exclusive terms. (In [5] and here, the word "exclusive" in this context is meant to mean either global exclusivity or restrictive as to market or field of use.) For example, up through 1997, 90% of the licenses by the UC system and at least 58.8% by Stanford were exclusive in this sense. These rates of exclusive licensing hold for biomedical licenses within the respective portfolios. But these rates do not apply to software licenses. For example, only 46% of Stanford's software licenses were exclusive. For Columbia, the university with the highest IP license income, only 17% of the software licenses were exclusive.

Another interesting fact in [5] is

> Nevertheless, the licensing accounting for the largest share of revenues at all of these universities are non-exclusive licenses. The Stanford-UC Cohen-Boyer patents were licensed widely and non-exclusively. Columbia University's Axel biotechnology patent was also licensed on a non-exclusive basis.

9 The Emerging Trend Toward Computational Biology

The premise of this paper is that CS/ECE IP is fundamentally different than biomedical and agricultural IP and should be so treated by university OTLs. But computer science research is increasingly focused on computational biology and bioinformatics. Will the nature of CS/ECE IP change as a result of this trend?

I do not believe so. While molecules have unique properties and patented algorithms may be used to create them, the biotech algorithms are no more likely to be clearly unique and defensible than other algorithms. For example, a prominent company which has filed for a patent on its bioinformatics algorithm is not exploiting the algorithm for commercial purposes, partly because the company gets good publicity out of the widespread adoption of its once-radical techniques [private communication].

10 Recommended Licensing Terms

Companies do not generally want exclusive licenses to CS/ECE IP. The licenses accounting for the largest share of revenue at Stanford, UC and Columbia were non-exclusive [5] (page 115).

Recommendation 2: Universities should assume that non-exclusive licenses are sufficient.

Because of the large number of patents involved in the typical electronic consumer product, accounting for the use of each patent in a product is onerous and expensive; so companies do not like royalty bearing licenses.

Recommendation 3: Universities should offer royalty-free licenses, perhaps with some upfront fee.

Time is of critical importance to companies.

Recommendation 4: Universities should have a standard policy, agreed in advance for CS/ECE IP, for what would normally be considered generous terms for licensing. For example, a royalty-free non-exclusive licenses for any CS/ECE IP in the university's portfolio may be purchased for a fixed fee. See Stanford's Epic Program.

What should become of IP generated by university personnel working under an industrially sponsored research agreement?

Recommendation 5: The university should grant the industrial sponsor a free, non-exclusive, non-transferable, royalty-free license for internal research purposes to all patented CS/ECE IP generated by university personnel working under the agreement. Furthermore, for a fixed annual fee in the vicinity of $1,000, the university should grant a non-exclusive, non-transferable, world-wide, royalty-free license without the right to sublicense (in a designed field of use, where appropriate) for the sponsor to make or have made products exploiting the IP.

This recommendation is essentially one of the options provided in MIT's "standard research agreement" (where the fixed fee is $3,000). I lower the fee for CS/ECE IP simply to encourage sponsored research. I would suggest that other companies with longterm sponsored research agreements with the university have access to similar licenses for a fixed but higher fee. This may be formalized with a program similar to Stanford's Epic Program.

The most important conclusion of this paper is embodied in the following recommendation.

Recommendation 6: University OSPs and OTLs should recognize the unusual nature of CS/ECE IP.

11 Conclusion

It is not my position that CS/ECE IP is worthless. Each invention must be evaluated realistically on its merits. But it is my position that, on the average, one must be skeptical about the likely licensing return from such IP. Furthermore, it is extremely dangerous to computing research for sponsored research to be discouraged by the adoption of aggressive IP positions by universities.

It is also my opinion that a model agreement put forth by industry and university computing faculty is unlikely to produce the desired effect on university licensing assumptions and procedures. The reason is that the recommended model agreement is sufficiently different from the standard policy that it will likely be dismissed by the typical OTL as naive or self-serving to industry. A more direct attack on the problem is recommended: CRA should try to educate OTL officers in the value of CS/ECE IP and the dangers faced by the university in the loss of industrial SRA income. I believe that should this education be successful it is within the power of existing OTLs to be flexible.

It has been suggested that the best educational tool might be a few signed agreements between top CS universities and industrial research sponsors. Unfortunately, the terms of such agreements are often confidential and "sanitizing" the agreements reduces their credibility. Nevertheless, the committee is striving to obtain such agreements.

References

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