

ASSOCIATION OF UNIVERSITY TECHNOLOGY MANAGERS LICENSING ACTIVITY SURVEY

Proposed by

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Priority changes suggested

- Tracking the flow in university offices of technology transfer (UOTT).
- Tracking the marketing of licenses.
- Tracking the use of business plans to market patents.

Potential advancement in understanding innovation

The UOTT serves as the vital gatekeeper of university intellectual properties; it is important to keep inventions flowing out smoothly. One set of questions suggested here would help researchers and UOTTs understand if the flow of intellectual property is being constrained, and if there is a need for rectification policies.

The second set of questions is founded on the premise that, if the inventor has pre-invention ties to a private firm, marketing the patent would be much easier compared with inventions where the pre-invention ties are lacking.

The third set of questions would track the use of business plans for marketing university inventions. Business plans would enable universities to market new technologies that do not have a ready market, but have a potentially large market that is not obvious.

SUMMARY

From the data published by the Association of University Technology Managers (AUTM) it is known that while university inventions are bringing in, as revenue, a bigger percentage of annual research expenditure (2.9 percent in 2006) than ever, it could be larger if university inventions flow faster to the market (i.e., commercialized). Among the several reasons for the restricted flow of university intellectual property (IP) is the lack of adequate invention processing capacity in the university offices of technology transfer (UOTT) (Swamidass & Vulasa, forthcoming). Each year, AUTM conducts a very valuable survey of UOTTs called, the "Licensing Activity Survey," covering universities in the United States and Canada. This survey is one-of-a-kind and provides a rare insight into the rate of commercialization of intellectual properties originating from research universities. The suggestions for new questions proposed here, if implemented, would provide a better understanding of the process surrounding the outflow of university inventions, the nature of the capacity bottleneck posed by the UOTTs, and information leading to appropriate internal and external policy response to speed the flow of university inventions to the market.

THE AUTM-LAS DATA SET

AUTM conducts a respected survey called the Annual Licensing Activity Survey. According to the last published survey of AUTM members in 2006 (Bostrum & Tieckelmann, 2007):

- U.S. universities received over \$45 billion in research and development expenditures, 68 percent being federal funds; 151 U.S. universities responded to the survey.
- The total of technology transfer employees was at an all-time high of 1,800; one-half of the universities reported six or fewer technology transfer employees.
- U.S. universities executed 4,192 licenses and options (exclusive and nonexclusive); the licenses executed were with start-ups (698), small companies (2,127), and large companies (1,327).
- The 189 respondents, including nonuniversities, reported 18,874 invention disclosures, 11,622 new patent applications, and 3,255 patents issued.
- AUTM surveys (published each year since the first survey in 1993) provide data for trends analyses. The trends show growth in every measure of the commercialization activity since 1993 including, staffing levels, number of disclosures, royalty income, etc.

More information about the database is available at:
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1024029.

WHY THE AUTM-LAS IS IMPORTANT

1. Provides a proven research database: Twelve percent of all studies (173 articles) on university entrepreneurship used AUTM data, according to the most extensive review of literature to date by Rothaermel, Agung and Jiang (2007). The annual publication of the survey results by AUTM is invaluable to researchers and students pursuing the health and progress of commercialization of university research; there is no substitute for the AUTM database. The database is made accessible on the Web to AUTM members and others by AUTM.

The database has information on royalty income, start-ups, full-time equivalents (FTEs) employed in technology commercialization, invention disclosures, patents applied for and patents granted. However, it does not provide information on licensing terms, financial terms, marketing, internal flow of work, and the use of tools, such as business plans. It provides numerical information over time on collective licensing practices, licensing FTEs and other FTEs, total research expenditures, federal government research expenditures, industrially funded research expenditures, new U.S. patents applied for, total U.S. patent applications, U.S. patents issued, legal fees expended and reimbursed, licenses/options executed, licenses/options generating license income, licenses/options executed with equity, and cumulative active licenses/options.

While the database does not answer all questions, it provides many important periodic, numerical metrics by which the commercialization of university research could be monitored and evaluated. It enables:

(1) The tracking of trends in most of the data reported; (2) The leveraging of AUTM secondary data by meaningfully combining it with primary data (Swamidass and Vulasa, forthcoming).

2. Enables the test of hypotheses concerning university technology transfer: The AUTM database reveals that license income as a percent of university research expenditure grew from 1.7 percent in 1995 to 2.9 percent in 2004 (Swamidass and Vulasa, 2008). Further, according to the database, new start-ups grew at the rate of 0.14 per university/year; it amounts to one start-up per university in seven years—note that start-ups are not the only licensees of university technologies.

One answer to the rate of start-up formation and license income may be found in the marketing of university inventions. Siegel, et al (2004) noted insufficient marketing capacity in UOTTs:

“In sum, our evidence suggests that TTOs are often either too narrowly focused on a small set of technical areas, or too focused on the legal aspects of licensing. It appears that the marketing aspect of the TTO is often given short shrift.”

Further, Mertz, et al. (2000) studied capacity building through technology transfer personnel. They identified skills and capabilities shortfalls in areas such as “technology selection, financing, marketing, maintenance, service, information dissemination, utility regulation, policy development, technology transfer, market intermediation, tax policies, microeconomic policies, and property rights,” (p. 120). Given the above, Swamidass and Vulasa (2008) hypothesized and investigated UOTTs’ capacity to process university inventions.

3. Tracks and evaluates university technology transfer models: There is unsettled debate about the effectiveness of the Bayh-Dole model in transferring university technology (Litan, Mitchell and Reedy, 2007; Rhoten and Powell, 2007; and Kenny and Patton, 2008). The AUTM database will remain vital in our ability to evaluate and investigate alternate models for university technology transfer.

NOTE: Several questions are suggested below to enable AUTM to select a few that are most appropriate for implementation.

PRIORITY IMPROVEMENT 1: TRACKING THE FLOW

The theme of this improvement is: “Capacity bottlenecks hinder the outflow of university intellectual property.” Because OTTs are gatekeepers of intellectual properties flowing from research universities, it is essential that OTTs allow this vital flow to occur without any hinderance whatsoever. Operations management and continuous improvement literature tell us that it is extremely easy to hinder the smooth

flow of goods and services without trying. Capacity limitations create common bottlenecks in the flow of goods, services and information.

This suggested improvement to the AUTM survey addresses the questions: Is there an invention processing bottleneck in the offices of technology transfer in universities? How is the bottleneck interfering with the smooth flow of intellectual property to the commercial world? It is suggested that one or more versions of the following question(s) be added to assess the hinderance to the flow of inventions to the market:

- Suggested Question 1: What percent of disclosures during the year were not processed by the end of the year due to lack of FTE at the UOTT?
- Suggested Question 2: What is the average queue wait time for disclosures before they are taken up for processing?
- Suggested Question 3: What is the average queue wait time before disclosures are processed for non-provisional patent application?
- Suggested Question 4: What is the average time to license a technology after receiving the disclosure?

IMPLICATION OF TRACKING THE FLOW

The response to the above questions would build a few benchmarks for flow rates and bottlenecks as measured by processing times and wait times inside UOTTs. These benchmarks could help improve the inner working of the motivated technology transfer offices and would enable training sessions and workshops focused on improving flow and reducing bottlenecks in technology transfer offices. In general, industrial and systems engineering experts and continuous improvement experts offer training to help with flow in profit-making organizations. AUTM could offer a similar service to UOTTs.

The data, so collected, would show inner efficiency of UOTT after we correct for potential bias caused by the nature and complexity of technologies flowing through the offices. Research questions that could be investigated by this data would give us insight into the commercialization process. A sample of two research questions that could be investigated is:

1. Factors that reduce the wait times in UOTTs.
2. Factors that reduce the average time to license new inventions processed by UOTTs.

COST ESTIMATE OF TRACKING THE FLOW

Given the magnitude of the existing AUTM survey document, the addition of some or all the questions suggested above should add negligible burden or cost to AUTM or to the respondents. Besides, for UOTTs, the value of knowing the average processing and wait times should outweigh negligible effort needed to complete these questions. Collecting data would require recording the date the disclosure was received, the date the processing of the disclosure began, the date the non-provisional application process began, and the date the license was executed. All or some of these dates are already in UOTT records.

PRIORITY IMPROVEMENT 2: PATENT MARKETING

If a university inventor(s) has a pre-invention tie with private companies, the chance of the invention being licensed is higher compared with inventions where the inventor has no pre-invention ties to industry. Marketing of patents that have no pre-invention ties to private-sector companies could be slow, time consuming, problematic and challenging. In these cases, marketing may start from scratch. For a discussion of marketing inventions with and without pre-invention ties, see Swamidass and Vulasa (forthcoming).

It would be useful for research and policy-making to gather information on the number of inventions with pre-invention ties to private firms and those without pre-invention ties. The following questions or their variations may be used by AUTM in future surveys to understand the extent of patent marketing challenges university OTTs face.

- Suggested Question 5: In how many patent applications filed this year did the inventor have pre-invention ties to one or more companies?

- Suggested Question 6: Of all the patents licensed or optioned this year, how many had pre-invention ties between the inventor and a private firm?
- Suggested Question 7: On a scale of 1-10 (where 1 = much easier, 5 = no difference, and 10 = much more difficult) rate the marketing challenge posed by patents without pre-invention ties compared with patents with pre-invention ties.
- Suggested Question 8: Please respond concerning your marketing effort for patents with and without pre-invention ties (check all that apply).
 - We market them differently.
 - We make no difference.
 - We should be marketing them differently.
 - We devote more resources to those with pre-invention ties.
 - We devote more resources to those without pre-invention ties.
- Suggested Question 9: Starting from the date of disclosure for patents with pre-invention ties between the inventor and private firms, what is the average time to license/option a patent?
- Suggested Question 10: Starting from the date of disclosure for inventions without pre-invention ties between the inventor and private firms, what is the average time to license/option a patent?

IMPLICATION OF TRACKING PATENT MARKETING

The questions suggested above will reveal to OTTs, as well as the research and policy-making community the difference and difficulty involved in marketing inventions with and without pre-invention ties to industry. This data and resulting trend over time would help OTTs understand more precisely the nature of the patent marketing challenge and how it varies with pre-invention ties with private businesses.

COST ESTIMATE OF TRACKING PATENT MARKETING

The cost may not be substantial; AUTM would be a better judge of this cost.

PRIORITY IMPROVEMENT 3: BUSINESS PLANS

The thesis for this improvement is: “Most investors are not looking for new technologies; they are looking for cash flow.” To improve marketing success, promising university technologies must be translated to sound business plans that sell to a wider audience.

Marketing of new university inventions is a significant task that is not easily mastered. Dr. Das, a high-technology entrepreneur and CEO of Transwitch, remarked that “...high technology is ...one of the most difficult things to market” in a lecture to Auburn University students in 2006; he also added that it is not something taught in business schools.

Marketing when pre-invention ties exist: A university invention may result from pre-invention ties between the university inventor and a business firm that could use the technology readily. In such cases, the marketing step may be irrelevant before licensing to the private firm already tied to the inventor.

Marketing when pre-invention ties do not exist: When pre-invention ties between the inventor and a business are nonexistent, the marketing of the invention becomes a critical factor (make or break) in the successful licensing of the technology. Inventions from federally funded research are more likely to be devoid of industrial ties; they need active marketing to find a potential licensor.

Federally funded inventions without pre-invention ties to business firms may not make business sense to most potential investors because the licensee must be made aware of the potentials of the technology, target markets, and cash flow implications of the invention. While the invention may be very sound technologically, investors (unfamiliar with the technology) may not see a direct link between the technology and cash flow. In such cases, a business plan may help communicate the business value of the technology to potential investors outside the relevant industry. However, UOTTs may not have the staff to prepare

business plans, which are time-consuming and require a great deal of understanding of the future market and substitution capabilities of the new technology.

Another hurdle to marketing inventions with no pre-invention ties is the resistance to the new technology from established companies in the industry; the reasons being:

- The fear the new technology might cannibalize their existing products.
- The significant capital invested in the technology they already own. In addition, companies may not want to invest in a new technology that threatens their existing products.
- The new university invention may require considerable time and investment to develop a viable product before commercial production. Investors outside the relevant industry would invest in the technology only if they could see a sound business plan with an attractive cash flow.

A case in point is the invention to recover nylon from used carpets developed at Auburn University (federally funded) and patented in 1997; it had no pre-invention contact with a private firm. Given the strong market for recycled nylon—the supply of used carpets in the United States is substantial (five billion pounds a year while only 7 percent is recycled)—and the fact that nylon is derived from crude oil made this an attractive technology. However, the lack of interest from the largest carpet and nylon producers left the technology on the shelf notwithstanding an effort to license the technology by the UOTT to those companies. In 2006 (nine years after the patent issue date), a business plan (showing target markets and cash flow for five years) was prepared by a team of graduate and undergraduate students led by a business school professor with an engineering and industry background.

The business plan attracted a licensee resulting in a start-up business within twelve months from the start of the business plan effort at the university. In the twelve months following the incorporation, the company has investment/commitment for nearly \$3 million in private equity (fully subscribed; private equity came from outside the carpet/nylon industry) and contracted with a subcontractor to build a pilot plant. The point is: The cash-flow model together with the technology was more compelling to the licensee and investors than the technology per se.

- Suggested Question 11: How many business plans were prepared by UOTT this year, and how many licenses/options resulted from these business plans?
- Suggested Question 12: How many business plans were prepared by university faculty/student teams, and how many licenses/options resulted from these business plans?
- Suggested Question 13: How many business plans were prepared by nonuniversity subcontractors, and how many licenses/options resulted from these business plans?

IMPLICATION OF TRACKING BUSINESS PLANS

The suggested questions would enable researchers and policy-makers to learn about the link between business plans and successful licensing of university inventions. If AUTM includes questions that track business plans and their success, UOTTs may begin to consider business plans as a licensing tool. Further, AUTM may develop training sessions and training materials for UOTT staff on effective business plan preparation. The would-be database with responses to the questions on business plans could address questions surrounding topics, such as:

- Effort devoted to business plans as a marketing tool by UOTTs?
- Effectiveness of business plans in attracting investors to university inventions?
- Effectiveness of UOTTs in embracing the business/engineering faculty/student talent within the university?
- Effectiveness of UOTTs in embracing nonuniversity subcontractors for licensing?

COST ESTIMATE OF TRACKING BUSINESS PLANS

The added cost for responding to an AUTM survey is likely to be negligible. It would require minimal record-keeping of university and nonuniversity teams preparing business plans and resulting licenses.

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