Introduction

Iowa State University (ISU) has a long history of technology transfer bringing meaningful technologies to society. Examples include the algorithm that enabled the fax machine to transmit data, lead free solder, a dozen plants varieties, and several animal vaccines, including a kennel cough vaccine that is reported to have saved the lives of 'millions' of dogs. ISU is fortunate have had enough technology transfer success to ensure that the ISU Research Foundation (ISURF) has been a self-funded operation since the early 1990's.

As outlined in the "Higher Education Community Recommendations for Improvements to PTAB Proceedings", submitted by the AAU, APLU, COGR, AUTM, and AAMC, a strong ***research*** *and* ***patent system*** is essential to effective technology transfer.

The observations and recommendations below are aimed at ensuring that the research feeding into the patent system is robust and relevant to industry, thus enabling universities to continue to contribute in a meaningful way to the advancement of society.

Trends

1. Government funding to both universities and federal labs is primarily aimed at technology readiness levels ("TRL") 0-2. TRL 0-2 is less mature than the benchmark of experimental proof of concept level TRL 3. More than 85% of the disclosures received by ISURF are TRL 0 – 3, with no funding available for further development.
2. Industry is increasingly unwilling to license technology prior to the TRL 6/7, leaving a gap in funding availability for TRL 3-6 to help de-risk the technology.
3. Startup companies are filling the gap. Industry prefers the university to de-risk the technology, and startups are becoming a standard vehicle to do this. As a result, companies are being formed at very early stages, primarily for the purpose of seeking SBIR/STTR funding for technology development.
4. Membership-based programs such as IUCRCs and ERCs are valuable programs, but they do not often result in increased licensing activity. While these programs have a positive impact for the participating industry and result in increased knowledge transfer, their full impact might not be captured by traditional technology transfer metrics.
5. There has been an increase in federal funding programs requiring industry participation; these rarely lead to patent and licensing activities, as they focus on pre-competitive research.

Responses

1. What are the core federal technology transfer principles and practices that should be protected and those which should be adapted or changed?
   - Bayh-Dole should be protected and expanded to include software and other copyrightable materials.
   - SBIR/STTR should be protected and expanded related to startups and "cloned" to broaden its de-risking impact on technologies that are licensing opportunities to existing companies (see below).

2. What are the **issues** that pose system challenges to the effective transfer of technology, knowledge, and capabilities resulting from Federal R&D? What are the proposed **solutions**:

UNIVERSITY-RELATED ISSUES

- ISSUE: Transaction costs related to negotiating intellectual property and indemnification clauses is stated as an *identified barrier in the RFI*.

  SOLUTION: At Iowa State University, we have developed a set of "flexible solutions" for working with industry, that provide the inventor and the industry that funds the work choice up-front about who will own the intellectual property and mange commercialization risk. That has greatly reduced the transaction costs related to intellectual property. Allowing inventors and industry a choice in how they interact, while preserving the core values of Bayh-Dole has led to a more productive environment for industry engagement. While Flexible Solutions is targeted toward industry-funded research, these same principles could be applied to the federal labs, bringing recognition to what industry is bringing to the table.

- ISSUE: U.S. Manufacturing requirement. ISURF currently has 3 technologies that multi-national companies would like to commercialize, but their manufacturing facilities are not in the U.S. These technologies could make meaningful contributions to products, but do not justify building a separate manufacturing facility in the U.S. All three of these companies have had difficulties with the manufacturing requirements and are still trying to obtain waivers.

  SOLUTION: For off-shore manufacturing, require a small percentage of the royalties collected, to be used by the TTO office, in partnership with their home-state's MEP operation, to facilitate education and technology transfer into small/medium sized U.S. manufacturing companies.

- ISSUE: Startups are being formed for the purpose of advancing technology, not for the purpose of selling a product/service.

  SOLUTION: Develop a sister-program to SBIR, with the same focus on developing the commercial opportunity in parallel to technology development through funding of TRL levels 2-6, but do not require the formation of a startup-company. The end goal is to have a technology that is an attractive licensing opportunity for existing industry.

- ISSUE: Inventors are pulled in multiple directions and prioritize proposal submission over end-of-award technology transfer activities, sometimes making it difficult to produce quality patent applications and to provide assistance to licensees (primarily small/medium sized companies).

  SOLUTIONS: (1) For each individual being paid at least a partial salary on a federal award (except for hourly undergraduates), encourage some effort to be spent in collaboration with the technology transfer office. For example, if you are PI on a federal award, the effort spent preparing disclosures, reviewing patent applications, etc., is encouraged and included in reports.
  (2) Preserve and expand SBIR/STTR funding. Professors who have gone through tech transfer process successfully (Phase I to Phase II transition) should have higher success rates for SBIR funding in a formalized process.

- ISSUE: Technology Transfer offices are more effective when they are invited to the table at an early stage. TTO's traditionally are only engaged at the end, after something has been "invented". For traditional federal grants and contracts, this is not an issue. However, for federally funded programs that require industry-university collaboration, opportunities are often missed, or expectations have to be adjusted, because the TTO was not consulted.

  SOLUTION: Encourage TTO involvement in programs such as NSF ARPAE, GOALI, IUCRC, ERC, etc., and allow the TTO to budget time on the grant, thus also helping to fund the TTO.

GRADUATE STUDENT RELATED ISSUES

- ISSUE: Graduate student training programs do not focus on entrepreneurship

  SOLUTION: Create new Graduate training programs focused specifically on entrepreneurship

- ISSUE: After ICorp or other startup programs, what's next? Tech-based startup are increasingly starting at earlier stages and the research is still years away from a product. Programs like ICorp have had enormous impact, but there is no funded mechanism to continue the process beyond ICorp, and funding for ICorp is limited.

  SOLUTION: Provide formal programs that are targeted to the tech-based startups that need 10 years to get to a product. This could include accelerator programs, phase II ICorp, etc.

FEDERAL LAB RELATED ISSUES

- ISSUE: Inaccessibility of facilities at Federal Labs. Federal labs contain valuable equipment and facilities that could help with moving technologies to translation, but that are difficult to access, particularly from a fee-for-service standpoint.

  SOLUTION: Create models that allow for seamless collaboration between Federal Labs and Universities and allow easy fee-for-service access to specialized equipment and facilities.

- ISSUE: A driver for University technology transfer efforts is the engagement of graduate students and postdoctoral researchers. Many federal labs generally do not train graduate students, and therefore the culture of tech transfer might be lacking in Federal Labs compared to Universities.

  SOLUTION: Federal Labs could be involved in graduate student and postdoctoral researcher training, through increased collaboration and partnership with universities. This will facilitate both traditional tech transfer via licensing, and tech transfer via startups, as the propensity for startups is higher for grad students and postdoctoral researchers. Federal Lab researchers should be encouraged to participate on scientific advisory boards for startup companies.

OTHER KEY ISSUES

- ISSUE: Companies are increasingly unwilling to license technologies at early TRL stages.

  SOLUTIONS:
  a. Offer a tax credit for patent costs, to companies that license university technologies and reimburse patent costs, TRL 0 – 4.
  b. Offer tax credits for companies funding research to advance early-stage (TRL 0 - 4) federally-funded university technology

- ISSUE: A major issue with commercialization can involve issue of scale. Can there be support for scale-up?

  SOLUTION: Partnering with industry to help fund scale-up and TRL 2-6 to de-risk might be required. Tax credits or cost-share are needed to incentivize industry to do that.

- ISSUE: The current metrics that are most-used include the number of disclosures (per $10M in research), the number of patents issued, and the income received by the TTO. These measures are important and should continue to be recorded and monitored. However, there are additional metrics that could be considered, to capture additional TTO impact.

SOLUTION:

a. Products
    i. Report "products on the market" that contain university technology. These would likely need to be subdivided based on whether the product contains patented (or previously patented), copyrighted works, tangible property, etc.
    ii. Count/report products based on university research that was not patentable, but had commercial value (for example, there is a biodegradable flower pot being sold that was developed at Iowa State but not patentable, so we don't get "credit" for it).
    iii. Finally, for universities that offer companies a NERF (non-exclusive royalty-free license) under industry-sponsored projects, report commercial activity based on that research.
b. Report federally funded background IP that is being used in Research Projects. Often this background IP is improved and it is the "new" IP that becomes commercially relevant.

- ISSUE: For both industry-funded and public-private partnership research, it is very difficult to know what industry "took home" from the project and how they applied it. We suspect that know-how and information gets utilized in a variety of ways and has a significant impact, but there is not quantitative or qualitative method to evaluate this

  SOLUTION: Incentivize industry to report the benefits received from collaborating with universities and federal labs.

3. What are other ways to significantly improve the transfer of technology, knowledge, and capabilities resulting from Federal R&D to benefit U.S. innovation and the economy? What changes would these proposed improvements require to Federal technology transfer practices, policies, regulations, and legislation?
    - Tax credits for patent and R&D expenses for companies that license early stage technologies – incentivize industry?
    - Bridge programs for TRL 2-TR 7. Venture capital- tax credits to facilitate activities across geographic locations.
    - Suggest federal labs in close proximity take advantage of University's tech transfer office expertise. The Iowa State University Research Foundation provide Tech Transfer services to Ames Lab. This long-term collaboration has been very successful and makes efficient use of both university and federal lab resources. Many of the barriers for university-federal lab collaborations that came up at the Chicago public meeting are not an issue between Iowa State and Ames lab; we have a synergistic relationship that is evident by the tech transfer success that has come from the Ames Lab.