The Need To Improve How We Communicate The Value And Impact Of Academic Technology Transfer And Knowledge Exchange Activities*

By John A. Fraser

1. Introduction

In spite of widespread activities in U.S. universities since the mid-1980s, many of the key stakeholders in our activities do not yet have an appreciation of the positive impact of academic technology transfer (TT)[1] and knowledge exchange (KE)[2] on their institutions and the U.S. economy.

Early examples include the Cottrell Electrostatic Precipitator[3] invented by FG Cottrell at the University of California at Berkeley in 1907 and the Canadian discovery of the importance of Insulin at the University of Toronto and its commercialization by the Eli Lilly Corporation in the 1920s.[4] A major expansion of the activity occurred with the passage of the Bayh-Dole Act in the early 1980s. Both AUTM and the Federal Lab Consortium have annual reports on such yearly activity.

What about today? Recent examples include the partnerships amongst universities and federal labs to assist the private sector to create successful COVID vaccines.

Why is there still a perceived lack of understanding by many of our stakeholders of the impact of our activities?

Possibly because our stakeholders (elected officials, senior leadership of research institutions) have turnover in their positions and also have a very broad scope of responsibilities in which oversight of technology transfer is a small part. Thus, understanding of our impact is modest to begin with and lost as they leave their posts and move on.

It is also clear that we TT practitioners have communicated primarily using transaction metrics (numbers of disclosures, patent applications, licenses, etc.) and stories. This is fine as far as it goes, but I believe that primarily using transaction metrics severely limits the way in which we can communicate the impact and value of what we do!

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Why?

Communicating using primarily transaction metrics forces the audience to understand the mechanisms of how we practitioners do things. The audience asks themselves, "why are disclosures and patents so important?" In reality, the audience is not overly concerned with the mechanics of how we do things. What they do care about is how our activities can help them do their job of achieving institutional goals and advancing their careers.

The Solution?

Determine who is in the audience we are addressing and describe the benefits for them of our activities, next reinforce understanding by using a story or two to put a name and face to the successful activity and finally use the transaction metrics to show how the activity scales to have a very measurable economic impact. This will be expanded later in the article.

Why is it increasingly important to clearly communicate the impact and value of what we do? Because what we do matters!

Dr. Norman Augustine (and coauthor Neal Lane) have once again stepped forward to issue a clarion call[5] that "the country's global leadership is being challenged in a rapidly changing and increasingly competitive world. The United States cannot afford to be complacent about the advancements in science and technology that are needed to power the economy, defend the nation, maintain public health, and combat climate change."

*This paper is based on the content of the "Improving The Communication Of The Value And Impact Of What We Do" roundtable presented at the 2022 AUTM AGM in new Orleans.

1. Technology transfer is the name used largely in the United States to describe the process by which existing knowledge, facilities or capabilities developed under research and development (R&D) funding are utilized to fulfill public and private needs.

2. Knowledge Exchange (KE) or Knowledge Transfer (KT) is a term used largely in the United Kingdom to describe the equivalent process, which aims to maximize the two–way flow of technology, IP and ideas. In turn this enables companies (existing and new) or other non–academic organizations and the public sector, to drive innovation leading to economic and social benefit and enables publicly funded research organizations (PROs) to advance research and teaching.

3. *https://en.wikipedia.org/wiki/Electrostatic_precipitator.*

4. *https://en.wikipedia.org/wiki/Insulin.*

5. *https://bit.ly/3tuVxKP.*

As he did previously,[6] Dr. Augustine outlines an action plan and acknowledges that "basic research, whether purely curiosity-driven or use-inspired, is of special consequence as its products include not only discoveries (made freely available to the world), but also science and engineering graduates who are the engines of research, **and the transfer of knowledge and technology from laboratory to society.**"

As I write this article (Summer 2022), Congress is considering bills of relevance to our activities. Monies targeted to the translation and transfer of research results to the economy are being debated. Not since the Bayh-Dole Act itself has technology transfer had such a positive profile in Congress.

At this critical juncture, how do we improve our communication of the value and impact of what we do? How do we communicate that we need to be part of this America as it moves forward and competes globally? How do we win the arguments that we need the profile, financing and long-term support that is required?

Again, what can we do to better communicate the value and impact of what we do?

First, a suggestion that the discussion with others start with the benefits of our activities to certain audiences.

Let us divide the impact/value conversation for different audiences:

Inside the Research Institution:

Determine who your audience is and describe the *benefits* of what your office does for that audience: For example:

- **To Researchers**—Engagement with commercialization can accelerate your research career by connecting you with new partners, new important challenges, and new financial resources.
- **To Senior University Leadership**—TTO activities can enhance the reputation of the institution by demonstrating how on-campus research is addressing real societal problems.

Outside the Research Institution:

- **To Government**—TTO activities can demonstrate a productive response to state and federal government challenges to each institution to do what you already do but do more to help with the economy and build the Innovation Culture.
- **To the Local or Regional Community**—TTO activities can achieve results in terms of money external to the community coming into the institution via sponsored research office grants, via royalties from local licensees and via job creation in local spinout companies. Much of this external money is then spent locally via salaries, etc. I learned that to describe one of the benefits of spinouts to the local community, I had to describe it as offering new employment opportunities for students who graduated, left for the big city, but now want to come back home to raise a family.

Having described how the TTO activity benefits a particular audience, I have then found it effective to:

Present stories of successful TT deals—give examples with names and faces which show that this activity actually does work! The AUTM Better World Project is a great source of stories.[7]

Having presented stories, I have then found it critical to:

Present the TT metrics for your institution or state or use national AUTM stats[8] to show skeptics that this activity is scalable and has a meaningful/measurable impact. Incidentally, AUTM and BIO have authored recent studies[9] that show the macroeconomic impact of 22 years of academic technology transfer results in the United States. In summary:

"Using an updated, more complex, and most current input-output I-O approach to estimating the economic impact of academic licensing, assuming no detrimental product substitution effects, and summing that impact over 22 years of available data for academic U.S. AUTM survey respondents:

— total contribution of these academic licensors to industry gross output ranges from $723 billion to $1.7 trillion, in 2012 U.S. dollars;

— contributions to gross domestic product (GDP) range from $374 billion to $865 billion, in 2012 U.S. dollars; and

— estimates of the total number of person years of employment supported by these academic licensors' licensed-product sales range from 2.676 million to 5.883 million over the 22-year period.

The low end of the above range assumes a 2 percent earned royalty rate on licensees' product sales. The high end of the range assumes a 5 percent earned royalty rate on licensees' product sales.

Hopefully by the end of your presentation, the audience is aware, educated and interested. You must then be ready to respond to their question: "This is great, how can we help you?" What is your ASK of the audience?

Let me stress again, the importance of gathering and using transaction metrics!

- The metrics can be used to convince the audience that our activities are not simply one-off deals, but an ongoing activity that over time builds relationships

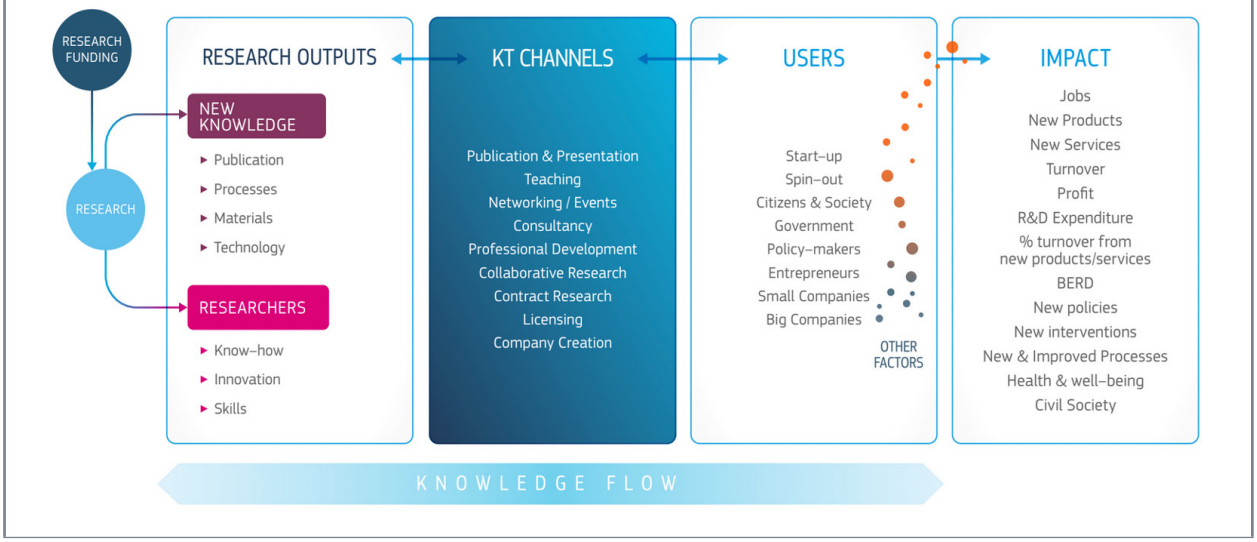
6. *https://bit.ly/36ekFN8.*

7. *https://bit.ly/3qoCyiP.*

8. *https://bit.ly/355V3Bs.*

9. *https://bit.ly/36GKB3O.*

Figure 1: Knowledge Transfer: From Research To Impact



1. There are several terms in use to describe the processes of knowledge valorisation. Knowledge Transfer (KT) and Knowl edge & Technology Transfer (KTT) are often interchangeable. Technology Transfer (TT) tends to refer to research commercialisation and may be considered a subset of KT. This report will use the KT terminology.
2. Publicly Funded Research Organisations (PROs) include universities, colleges and other governmental research institutions. The term PRO is used in this report.
3. Available at: *http://www.innovationbycollaboration.se/wp-content/uploads/2015/09/Kevin-Cullen.pdf*

with the private sector, helps the institution respond to government requests to help build economic activity and enhances the institution's reputation.

- The metrics allow the TTO to put names and faces to these activities in specific understandable terms.
- Metrics have a key role but cannot be the sole means of communication.

But these are still transaction metrics. Are we thinking broadly enough? Consider the many ways that knowledge and technology is transferred (KT & TT) off campus[10] as in this graphic. These are formalized, papered arrangements—the KT channels. See Figure 1.

Based on the preceding, when you measure the number or the dollar value of the contracts, as in the graphic below, the commercialization activities (IP licensing, company creation) are only a very small part of the entire KE process (2 percent in the U.K., 8 percent in Australia) but very focused on improving the economy via the use of IP licensing to both existing and to newly created spinout companies. See Figure 2.

So again, how should we measure and communicate impact and value?

Remember that context matters. When you measure/communicate impact do not do it in isolation from impact measures of the rest of the organization!

As the Campbell Report[11] states: "Output indicators cannot be assessed in isolation. Context matters. Often overlooked is the fact that the Knowledge Transfer Indicators (KT indicators-Metrics) are a measure of the performance of the Organization (Public Research Organization, PRO) and not of its KT office. KT and Impact are not the sole responsibility of the KTO. The KTO provides a professional service function within the overall PRO context and the PRO mission, environment, priorities and support determine its activities and performance."

More Ideas from the United Kingdom:

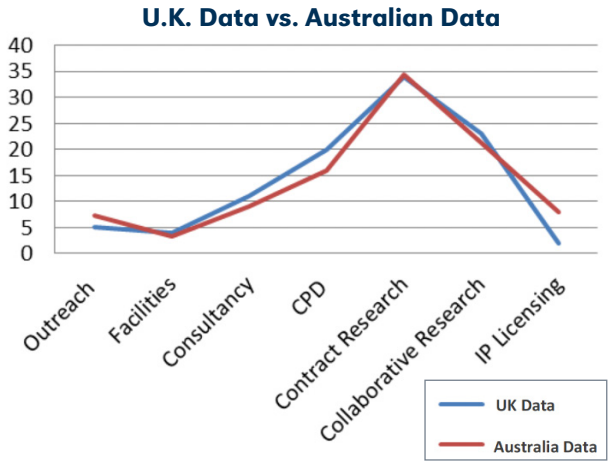
15 years ago, the impact of research was widely discussed as part of the conversation of the RoI of the government research investment. It was decided that grant applications for university research funding were to include an impact statement, which was based on the categories in the graphic below. Grant applicants had access to many examples in each of the categories to aid in clarifying where their own research could have an impact. Each impact statement would be evaluated by peer committees familiar with each category and that assessment counted for 25 percent of the merit score

10. From: "KNOWLEDGE TRANSFER METRICS." Towards a European–wide set of Harmonised indicators. Alison Campbell, Chair. *https://bit.ly/3L7jaz6.*

11. *https://bit.ly/3L7jaz6.*

Figure 2: Australian And U.K. Data

	U.K. Data	Australian Data
Outreach	5	7
Facilities	4	3
Consultancy	11	9
CPD	20	16
Contract Research	34	34
Collaborative Research	23	21
IP Licensing	2	8
# of agreements	99	98



Reference: *http://www.sciencedirect.com/science/article/abs/pii/S0048733307001199*

for any application for public funding. This process remains in place today. See Figure 3.

The above categories/definitions cover all types of research: Social Sciences, Humanities, Arts Economics SHARE), and STEM and other non-STEM areas in the U.K.

Recall the fact that you cannot fashion something beautiful or valuable out of poor materials. "It is hard to make a silk purse out of a sow's ear." We are reminded of this in the actual title of this peer publication: "Disclosure and Licensing of University inventions.." 'The best we can do with the s**t we get to work with.'[12]

Let's look at other factors in measuring and communicating impact and value?

Impact Inside The Licensee Corporations: A MIT study published in 1997[13] found that for every active MIT exclusive license signed and still active, the licensee corporation spent approximately $1 million/year from license signing until the product based on the licensed technology entered the marketplace. Identical results were found by similar studies published at both the University of Pennsylvania[14] and at Ohio State University.

Societal Impact: Edwin Mansfield, a University

Types of Research Impact: UK Definition

The above categories/definitions cover all types of research: Social Sciences, Humanities, Arts Economics SHARE), and STEM and other non-STEM areas in the U.K.

12. Richard A. Jensen, Jerry G. Thursby, Marie C. Thursby* University of Notre Dame, Notre Dame, IN 46556, USA, Emory University, Atlanta, GA 30322, USA, Georgia Institute of Technology and NBER, Atlanta, GA 30332, USA. @ 2003.

13. MIT Pre-Production Study. Pg. ii Vol 7 *AUTM Journal*, 1997.

14. UPenn Preproduction Study volume 9 *Journal of AUTM ppii.pdf.*

of Pennsylvania professor, published relevant papers in the 1980s and early 1990s.[15] One study concluded that a company that invests in new products will capture only about 25 percent of the benefits of the investment (financial and otherwise). Society will capture twice as much—at 54 percent—with the rest too diffuse to measure.

In another study in 1991, Mansfield surveyed 76 large firms in seven manufacturing industries to see how many of their product and process innovations introduced in 1975–1985 could not have been made without academic science research performed in the 15 years before the innovation.

On average for those seven industries, 11 percent of their new products could not have been developed without recent academic research.

The variation between industries is substantial, ranging from a low of 1 percent in the oil industry to a high of 27 percent in the drug industry. The average time lag between the academic research and the industrial innovation was about seven years.

In 1992, Mansfield published his estimate of the social rate of return of academic research. He estimated it at 40 percent. This meant a benefit to society of $40 for every $100 spent on academic research (Mansfield, 1992, p. 296).

Inside The Marketplace/Community: One significant paper that contributes to the impact/value discussion is "The Contribution of Public Sector Research to the Discovery of New Drugs and Vaccines," by Ashley J. Stevens, Mark L. Rohrbaugh *et al.*[16]

The authors showed that over 30 years, 153 new Food and Drug Administration-approved vaccines, drugs and/or new indications for existing drugs were created during the course of research carried out in public sector institutions. An update of the paper will expand the list to over 200. Similar results were compiled when the authors studied medical devices (to be published).[17]

A much broader look at impact and value can be found in an annual report titled the *Global Innovation Index*[18] published by the World Intellectual Property Organization (WIPO), based in Geneva. As the Report states:

The Global Innovation Index (GII) takes the pulse of the most recent global innovation trends. It ranks the innovation ecosystem performance of economies around the globe each year while highlighting innovation strengths and weaknesses and particular gaps in innovation metrics.

Envisioned to capture as complete a picture of innovation as possible, the Index comprises around 80 indicators, including measures on the political environment, education, infrastructure, and knowledge creation of each economy.

The different metrics that the GII offers can be used to monitor performance and benchmark developments against economies within the same region or income group classification.

The 80 factors gathered from over 120 countries cover inputs, outputs, outcomes, and impact.

As Mansfield so eloquently showed numerous times, there is an impact beyond the licensor and the licensee.

As practitioners, we are very creative in the deals we do, but perhaps too cautious to claim full or partial credit. Max Wallace, then at Duke University, gave this advice at an AUTM meeting: "When looking for the impact of our activities, shoot anything that flies overhead and claim anything that falls." Be expansive, but specific.

Previously, rather than studying what our impact is, we tended to fall back on "we are too resource limited." Or "I have an office to run, I don't have time to follow this." And remember that if we don't do the study or get someone to do it, it won't get done!

How Do You Communicate With Someone Who Has Significant Influence?

Let's say that you have 15 minutes alone with President Biden in the Oval Office and he asks you: How are you contributing to the country as an employee? What do you say? Would you start off by talking about metrics? NO!

You would likely start with a story or show him examples from either the AUTM Better World Project[19] or the FLC Labtech in Your Life interactive website.[20]

Then, given the world today, he may ask you: "How are you helping our warriors?" Make sure you have an answer. After that you can explain the extensive other benefits of other examples from academic technology transfer activity in the U.S.

He may ask you: How can I help? Your answer might incorporate ideas like the following: *Please continue to increase funding for basic research. After years of*

15. Research Policy 32 (2003) 1607–1617. *www.elsevier.com/locate/econbase.*

16. *New England Journal of Medicine,* 364;6 *nejm.org* February 10, 2011.

17. Personal communication.

18. *https://www.wipo.int/global_innovation_index/en/2020/.*

19. *https://autm.net/about-tech-transfer/better-world-project.*

20. *https://www.youtube.com/watch?v=icASZiM8lU8.*

diminishing support as a percentage of GDP, we need to increase our funding of this area. Why? China has recognized the importance of world leadership by attempting to dominate research in new, key areas. We cannot be left behind.

Broad support for basic research and its conversion into practical uses has allowed the U.S. to dominate the global innovation economy for decades, creating new industries, jobs and increasing wealth. But our leadership is slipping. We need to regain momentum. In addition, we need specific financial support for the translation of research into useable results, products, and jobs. Academic technology transfer links the creativity of research in all sectors to improving our economy, increasing our security and showing the world what American freedom, security, entrepreneurship and democracy can achieve.

When he escorts you out of his office, then hand him a copy of the annual "Congressional Report on Federal Technology Transfer—the Metrics" and a copy of the AUTM Annual Licensing Activity Survey.

With luck, his Chief of Staff will check it out and suggest that the President carve out five minutes from his next State of the Union address to remind us why academic 'technology transfer helps make America the greatest country in the world.

Having covered the factors to use, how do you measure whether your communication is indeed having an impact?

The following is drawn from a recent presentation by Laura A. Schoppe, who suggests the following tool to answer that question:

- A: Who is your target audience?
- M: What is your message?
- M: What is your method to reach them?
- O: What is the outcome? What do you want them to do?

Clearly, if the audience responds to actionable suggestions that can be measured, you can answer the question.

Next, over time, you can measure whether your activities are positively influencing your organizational culture.[21,22]

Several Out-Of-The-Box Suggestions As To How To Improve Our Communications? What To Do Next?

- Within the technology transfer community, there are likely people who have relatives who work on Madison Avenue in New York City. Why not gather a group of Madison Avenue marketers in a brainstorming session and ask them: How do we communicate our impact and value. It is highly likely that they will create a plan of action that also covers issues we have not thought about as we are too close to the activity. It is also very likely that they will suggest an appeal to the emotions of the audience, something that we TT practitioners tend not to do! Most of us have scientific backgrounds and we tend to rely on measurable data and not on appeals to emotions. Professional marketers/communicators are not so constrained.
- Brainstorm with other outsiders who see our work from a very different perspective.
- Do not get caught in the trap of communicating the metrics and believe we have done our job.
- Create standards and methods to measure the impact and value of our activities. Likely use a mixture of stories, case studies, standards and metrics. The Brits are in the midst of updating their impact plans for TT/KE - we can work with them.
- Communicate much more frequently the value and impact of what we do on a continuing basis to all types of stakeholders. Our stakeholders are responsible for a wide range of activities. It is our responsibility to raise our profile and show them the impact and value of what we do in order to continue to enjoy the support we have received in the past and to provide the rationale for continuing it and increasing it. ■

Available at Social Science Research Network (SSRN): *https://ssrn.com/abstract=4337774.*

21. *https://www.myhrfuture.com/blog/2019/7/19/how-can-you-measure-organisational-culture.*

22. *https://Bit.ly/3KJowAP.*