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"Impact Indicators for Research: Multi-dimensional measurements"

RESUME

Impact indicators are a hot topic in Europe. At Georgia Tech, we are currently working with our technology transfer office on tests for some innovation in that area. Our idea was that we should think about a portfolio of patents, and approach commercialization by focusing on the areas that have the greatest impact for society at large. We are developing a framework of indicators we could use within the University and to compare our performance with others. We also wanted to think through how the University defines impact, and how we might measure it.

Impacts don't happen on the campus itself but in the world we are trying to affect, and they involve a user. For students, we think about where they are going in their jobs, what they are doing for their employers, and how they see them. For research, users can be even broader than the scientific community. For our work with outside organizations, there is a "real world" user of some sort. Our campus is very much used to thinking about private sector or industry users, and we are trying to get them to think of others, since social sciences and humanities are more likely to have users that are in the public sector or in NGOs.

The next question is: where does the issue of impact step in? We start with strategy: we hire people who are doing the kinds of research we think we need to have impact in the world. Another place where impact thinking could affect strategic actions is the allocation of internal resources. When we consider forming a new centre or an institute, we think in terms of broad areas where the university has strengths and can have results. A particularly strategic moment for a university might be if it was thinking about a major reorganization of the more permanent units of the university.

We used a set of presentations developed by our interagency Science of Science Policy initiative, which is trying to develop a huge integrated database for the whole US system. As a background to that, we wanted to check what existed in terms of measuring impacts. While we were working on research evaluation, one review came out that focused much more on the European experience and particularly on societal impacts, with interesting visual representations of models. Some of them are linear — a causal chain is running through a pre-investment stage, into the inputs/activities/outputs section (with an interface

called dissemination), then the “secondary outputs” that occur outside the research process, and the adoption by a user. When you are looking for effect of something you do, you end up with causal logic. We also examined what I call the Keystone model, where you have knowledge being produced and delivered directly into the research front. The knowledge goes into a knowledge base and is then drawn on through graduate education.

We settled on using four impact areas: economy, society, workforce, and research.

The economic impacts are the ones the University is very used to thinking about, because we’re a technological university — two thirds of our faculty and graduate students are engineers. We are actually the number-one-program in the U.S. in logistics, we have a very strong multidisciplinary group in new media, a big concentration of microelectronics and nanotechnology, and we’re very active in advanced manufacturing. The university is used to thinking of those strategic areas, and we have a set of customary indicators to see whether the strategy is working out. They would certainly look for interaction with industry in various forms, including funding, industrial partnership programs or faculty consulting relationships, and they expect that particular research results will change something in industry.

We looked out if the research literature had anything new to offer beyond the model that our decision makers already have in mind. One approach that came out of the SOSP workshop is based on econometric methods to estimate the influence of funding on productivity in agriculture, but scaling it down to our university level was hard to picture.

Some other models used more sophisticated techniques. After building big datasets following people and firms for biotechnology and nanotechnologies, Zucker and Darby argued that the impacts of research come from people who go into firms after a research activity. AUTM established a long list of indicators they are recommending universities to gather in order to benchmark their technology transfer results against each other. Our technology transfer office is very familiar with AUTM, so we compared their set with what we had available, and we sorted out a couple of underlying concepts. The faculty consulting turns out to be relatively easy to get to, since the faculties have to report them to avoid any conflict of interest. We also have lots of indicators of our relationships with firms we put together to examine the richness and continuity in those relationships, beyond the specific mechanism we were already using. Royalties also are a relatively good indicator of whether somebody is using a technology beyond the firm that we are dealing with.

In the societal area, US literature was very thin. We did a review on the mismatch between concepts of policy impact and what is actually being measured by agencies, and ended up recommending measuring participation in policy networks. We could get there through data mining and text analysis methods. Most of the literature tracking impacts looks a lot like the economic impacts literature; it focuses on R&D in firms, using a lot of the same techniques including surveys of firms about how much they’ve used research. That’s the Mansfield style. The Payback framework was originally developed for health services research, but it is a general enough approach to be used in other areas as a research tool. It provides a common yet multidimensional structure for gathering data and facilitates

cross-case analysis, by providing another logic model, and some categories to classify the paybacks. The British evaluation group RAND developed a European “spider framework”, SIAMPI, which wasn’t designed to evaluate the outcomes or the impacts, but to learn about them and how they are produced, and to display them, leaving the judgment part to the decision makers. We will then try to track productive interactions.

Most of the ideas we gathered around social impacts turned out to be well beyond our small resources. We are nevertheless trying to track those policy appearances in the Congressional Record, to compare public events, using our university calendar, and to categorize the outside groups that we are interacting with. We also would like to use the SIAMPI diagram to do profiles of the different universities in how much of their effort addresses grand challenges. We would love to do case studies of outcomes using some of these more complex methods. We certainly need to have a way of finding cases that don’t just involve what is patented, and what goes through the technology transfer offices. The consulting data might be a good source of “relationships” data with some other organizations, and we are going to experiment with that too.

Workforce. NFS pays for big sample surveys, and a lot of individual information is available on the Internet or in big proprietary data sets. This is one of the big issues this big US database project is dealing with. The larger-scale vision is there, but the implementation is not there yet. Though people are one of universities’ main outputs, we have very little data on what they do after they leave. The development office is not tracking university impact and only does very frugal alumni surveys. The best we actually found is the study we do on students who just graduated, to find out whether they got a job or not. We should expand those surveys, since we’re doing them anyway.

Finally, research impact. Our campus has some of the world’s experts on this, who recommended the Leiden ranking sets, using normalized citation score and the proportion of the top 10% of publications. Then there is a research benchmarking work from a UNU information institute. When we look up the kind of combination of the indicators in those, we come out fairly strongly in fields where we think we are strong. That is the easiest part of the whole problem to address, and we need to have it into our model.

In summary, what we end up with is more in the economic and societal area: the consulting, multiple indicators about the relationships with firms, forming new companies, paying royalties back, some information about societal interactions, through publically available datasets, that can be benchmarked with other areas. Then we have our little graduation survey and citation measures.

Can the University use these indicators prospectively? Our management at Georgia Tech always wants to know where we stand in relation to our peer institutions, and what we can do to break through to the next level, so benchmarking is an exercise that will capture their imagination. It could have an impact on campus by making obvious a few of the simpler things that we can do to increase our information base. All the reports of people who are going to be promoted, in which they are supposed to specify their impact, are going to be coming through my new office, so we may be able to mine those for examples to look at prospectively. I think that the big impact of the impact indicators will be in thinking at a more sophisticated level about what impacts are. We may even be able to help our

engineering leadership to think about other places for us to change things in the world, and make lives better. What I really hope is that by using the framework one can come up with a few well worked-through concrete examples of new investment areas that Georgia Tech leadership is not thinking about yet, to demonstrate that the overall approach of adding measurement to intuition, may actually pay off at the end of university.