Board 47: An Analysis of the Existence of Metrics for University/Industry Collaboration

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Work in Progress: An Analysis of the Existence of Metrics for University/Industry Collaboration

Introduction:

Partnerships between universities and commercial enterprises have become relatively common and take a variety of forms. From traditional research projects at universities that yield data and knowledge businesses and industries can then use to improve processes and practice, to more specific training and development programs that focus on building particular skills for particular industries, the modern university finds itself collaborating with commercial enterprises on a number of fronts, and for a number of reasons.

For many universities, providing regional economic benefit to the areas they serve is a fundamental part of the institution's mission. The idea that the expertise and research found on college campuses should benefit the communities those universities inhabit is viewed as conventional wisdom both on and off campus. When that expertise or research is geared toward solving large scale and generalized problems such as alleviating health issues, or protecting the environment, the benefit is applied generally and viewed by those in and out of academia as mutually rewarding. This benevolence also seems to extend to more targeted efforts designed to create a 'pipeline' of well trained and educated individuals for specific industries. In many cases, preparing a competent workforce is also widely seen as part of the university mission.

The changing landscape of higher education funding has also no doubt had an impact. As universities deal with cuts in public funding sources, collaborations with business and industry are often viewed as financially attractive, by both the university and the business. The university may receive funding to help deploy a project, and the business or industry can access the expertise found on university campuses on a needs basis, as opposed to funding entire training or research departments within the organization itself [1]. Overall, then, these types of collaborations are generally viewed as mutually beneficial.

As noted, there are a wide variety of projects and programs that fall under the general umbrella of university/industry collaboration. This paper examines a work in progress research project that will include information on all the areas the universities studied, while focusing on collaborations that are designed to educate and train students not only for a particular career area, but for particular employers. The primary question this research project seeks to answer is whether universities use metrics or standards to evaluate businesses or industries before agreeing to participate in a partnership. This research project specifically examines if university/industry collaboratives in North Carolina evaluate an industry's behavior and policies before agreeing to engage in a partnership. Do universities in this state consider an employer's wage structure, employee safety record, and workplace culture before agreeing to prepare students to work in that environment? If such metrics exist, what do they include? If they don't exist, should they?

Do universities have any responsibility to ascertain whether the employer is providing a safe and equitable environment and fair pay before agreeing to such partnerships? The paper describes the research project, along with its challenges, and relates preliminary conclusions, along with possible areas for further research.

Literature Review:

In terms of general research on the topic, the issue of industry/university partnerships has generated a wealth of academic research. A simple search of the American Society for Engineering Education conference proceedings shows more than 1,000 articles on university industry partnerships have been published. The majority of the articles reviewed seem to explain the technical deployment of specific collaborations and how researchers structured partnerships, with the focus of many of these articles on how these programs delivered knowledge to both students and industry partners. Peters and Lucietto survey the state of these programs and note that the overarching benefit seems to be the development of research that benefits society [2]. White et al describes a call from industry for academia to more actively share the responsibility for preparing industry ready employees and suggests that producing employees who are capable of filling roles in industry is the primary goal of these types of partnerships [3]. While the research notes several factors identified as critical to the success of these partnerships, such as executive support, funding, and clear objectives, it does not address metrics universities use to assess partnerships.

There are hints of such factors in other studies. Connelly et al describes a program for technology transfer that not only considers the technical merit of proposed partnerships, but the overall economic benefit to the state and its businesses [4]. In addition to being reviewed by technical experts, each proposal to this program undergoes a review by "economic evaluators" with backgrounds in business. These evaluators specifically look at a project's potential for commercial success, its potential for producing job growth and its ability to generate revenue.

Bender suggests a number of factors universities should consider when engaging in partnership, including the location of the business, its size and profitability, whether alumni are involved, and specifically what types of degreed positions the company hires [5].

Overall, however, very little literature exists that details specific metrics or standards universities can use to assess collaborations with industry. However, a significant amount of literature exists across disciplines that details both how the changing landscape of higher education in the United States created the environment and the underlying foundation for current partnerships with industry, and the potential risks associated with them.

There is a wealth of literature across disciplines that provides a timeline of how scholars were considering these partnerships, and in what context. In 1997, Gregory briefly addresses the partnerships and their mutual value to universities in a variety of areas [6]. The information is prefaced with the prevailing perspective in academia that future funding cuts were unavoidable, and as such, many of the benefits enumerated are financial in nature. The benefits for industry are enumerated as improved recruitment, access to co-op students, and access to continuing education. Financial drivers are listed as reduced cost in funding research and access to early discoveries. The benefits for universities are an improvement in teaching; specifically, the ability to teach students what skills industry needed, research, and funding to continue the university's mission.

Gregory does identify hurdles for these partnerships: ownership of intellectual property and a difference in culture between industry and academe in research and how it is conducted, planned and shared. The author does not, however, suggest how these hurdles should be managed other than to caution that they should be dealt with before a partnership is launched.

Slaughter and Rhoades' 2004 text on the theory of Academic Capitalism grounds the changes in higher education in the past four decades as the impetus for the current reality and develops a specific theory in which to consider it [7]. In the latter part of the nineteenth century, the authors relate, universities began to focus on science-based programs such as engineering and agriculture, areas that focused more on the application of science to industry. Beginning in the 1970's, universities in the United States began to see public funding shrink. That, coupled with specific but short-lived economic downturns in the following decades tightened the financial belt further. But at the same time, the economy itself was shifting, moving toward a place where information and knowledge outstripped industrial manufacturing. Into this atmosphere, partnerships between universities, where knowledge and expertise are often created and housed, and industries, where that knowledge is deployed and that expertise needed, became even more central to the university identity.

Slaughter and Rhoades Theory of Academic Capitalism explores "the processes by which universities integrate with the new economy" [7]. New Economy in this context is what the authors define as a shift to a knowledge economy from an industrial manufacturing economy. To illustrate how deep the web connecting academe to industry spreads, consider this further explanation from Slaughter and Rhoades: "The theory of academic capitalism focuses on networks- new circuits of knowledge, interstitial organizational emergence, networks that intermediate between public and private sector, extended managerial capacity- that link institutions as well as faculty, administrators, academic professionals and students to the new economy" [7].

By 2005, the partnerships have become even further enmeshed, with Prigge adding regional economic development, which most university missions support, as an added benefit [1]. Prigge reiterates the risks for universities that the earlier article introduces, and does note that in academe, concerns are rising that these partnerships are altering the academic norm of open discovery and publishing and creating a culture that is more market driven, or "entrepreneurial" [1]. These concerns are especially prevalent in STEM fields, which is also the area identified as hosting the majority of industry/university partnerships [1], [8]. In the area of research and development partnerships in particular, additional risks are identified as possible financial loss and damage to the university's reputation as a trusted and neutral institution [9]. In more recent years, the literature continues to discuss these risks to universities in industry partnerships, what they might suggest or how they occur, [10] and explores the tensions and issues in specific areas such as the data sharing in digital social sciences research [11]. While the research and literature continues to evolve, identify the risks, and caution universities to address them, it does not seem to have addressed if and how universities translate those concerns into actual policies or metrics.

Research Structure and Method:

Given the depth of connection between universities and industries, and given the identification of risks and areas of concern, the research question posed is whether universities have devised metrics for evaluating partnerships with industry before entering the partnership. If so, what do

those metrics consider? To answer those questions, the researchers focused on all the public universities in the state of North Carolina, and the three largest (by enrollment) private universities in the same state. This would give the researchers a large enough pool of potential participants and also possibly provide a snapshot of how this issue was dealt with across the entire state, at both public and private institutions. In total, 17 universities were identified as possible participants. The research study was approved by the university's Institutional Review Board, although difficulties in securing interviews resulted in an amendment to the IRB protocol, which will be discussed in the preliminary results section of this paper. Researchers then analyzed each university's website to determine what types of university/industry collaborations were available, and who was responsible for that area. Those individuals were then contacted via e-mail and asked to participate in an online or face to face interview with the researchers regarding their university's use of metrics in evaluating university/industry partnerships. Those who responded and agreed were then interviewed and asked about their university's practices. It should be noted that none of the universities will be identified by name, nor will any of the individuals interviewed. This is part of the structure of the study to ensure participants felt comfortable speaking, and also to ensure that the study itself retains focus on the data and outcomes.

During the interviews, participants were asked these questions:

1. What types of industry partnerships does your university engage in?
2. How do businesses or industries become partners?
3. What is the process for setting up a partnership with business or industry?
4. What does the university consider before deciding to engage in a partnership?
5. Does your partnership provide credit bearing coursework, non-credit training, both or a hybrid?
6. How is the partnership funded?
7. What metrics or benchmarks do you use to determine if the university will engage in a partnership?
8. How does this partnership fit in with your institution's mission or purpose?
9. Do you investigate or vet the business/industry before agreeing to a partnership?
10. If the answer to #9 is yes, what factors do you consider in the vetting process?

After the interviews are completed, researchers will examine all of the results to discover where common themes or similar practices across campuses were emerging. Researchers will also examine individual results to see if any other consistencies exist, such as if universities in particular regions were similar, and if factors such as enrollment size seemed to impact results. Researchers will then be able to clearly see the current practice across the state in terms of this issue and suggest possible benchmarks that consider both current practice and the risks identified in the literature.

Preliminary Results and Challenges:

The initial e-mail asking for participation was sent out to the identified universities in early February 2023. That resulted in five responses; two universities sent back e-mail responses saying they did not have metrics that they used to evaluate potential partnerships, and therefore would not participate. Three others, two public universities and one private university, agreed to participate in the interviews. Those were arranged via videoconferencing software and conducted in February. The preliminary results for those universities can be seen in Table 1. The remaining universities did not respond to the initial call for participation. The researchers waited a week and sent out a second follow up e-mail once again asking for participation. That netted two responses from two public universities, with one asking in more detail what the research addressed. The researchers answered that question, and the university in question responded by saying they would contact us if they were interested in participating. The second public university noted briefly that there weren't set metrics, but there were factors they considered. Those factors were not detailed.

At this point, the researchers began to consider that perhaps asking for interviews might be a barrier to getting full participation. The concern was that participants were not responding to the request for interviews, and the researchers wanted to ensure full participation in the study. Perhaps time and availability were impacting the decision of the universities to participate. So, in an effort to make participation easier, the researchers went back to the Institutional Review Board and requested an amendment to the study. Researchers asked the IRB to approve delivery of the interview questions to participants via e-mail, with participants being allowed to write answers and send them to the researchers via e-mail. Expanding the method of gathering information to include e-mail, as well as interviews via phone or video conference, would provide participants with a third option, one that might better fit into their availability. The interview questions were amended slightly as a result.

1. What types of industry partnerships does your university engage in?
2. How do businesses or industries become partners with your university?
3. What is the process for setting up a partnership with business or industry at your university?
4. What does the university consider before deciding to engage in a partnership?
5. Does your partnership provide credit bearing coursework, non-credit training, both or a hybrid?
6. How is the partnership funded?
7. What metrics or benchmarks do you use to determine if the university will engage in a partnership?
8. Does this partnership fit in with your institution's mission or purpose? If so, how?
9. Do you investigate or vet the business/industry before agreeing to a partnership?
10. If the answer to #9 is yes, what factors do you consider in the vetting process? Are any issues such as the company's pay and benefits structure, safety record, reputation, or other similar factors considered?

Question 10 was amended slightly so that respondents who chose to answer the questions via e-mail would have an idea of what types of factors to consider. In a face-to-face interview, researchers can ask follow up questions about those factors to gain more information, but the

concern was that would not be a possibility if the questions were answered via e-mail, so the additional text was added to improve the clarity of the question for those answering by e-mail.

The Institutional Review Board approved the amendment, and the researchers were able to send another call to participate to those universities that had not yet responded updating them on this new option, and asking again for their participation.

The preliminary results are detailed below. Understanding how the results are labeled given the anonymity of the participants is important to understanding the results. Fourteen public and three private universities were asked to participate. Each public university will be identified as Public University with a corresponding number assigned at random (PU#1-14). Each private university will be identified as Private University with a corresponding number assigned at random (PR#1-3). Table 1 shows a summary of the results, which will be further explained in the narrative that follows.

University	Existence of Metrics?	Considerations
Public University 1	No	
Public University 2	No	
Public University 3	Yes	No set benchmarks; consider risk, reputation, alignment with mission
Public University 4	Yes	2 levels: first, a vetting to identify red flags; second, application of a matrix
Public University 5		
Public University 6		
Public University 7		
Public University 8		
Public University 9		
Public University 10		
Public University 11		
Public University 12		
Public University 13		
Public University 14		
Private University 1	Yes	No set benchmarks: consider Liability, Reputation, alignment with mission
Private University 2		
Private University 3		

Table 1: Summary of Results

As noted in the previous section, potential participants were initially contacted via e-mail to ask if they would be willing to be interviewed on their university's use of metrics in industry partnerships. Two universities, Public Universities 1 and 2, indicated in a response to that initial e-mail that their universities used no metrics in assessing university/industry partnerships.

Public University 4 (PU4) engages in a wide variety of partnerships and projects with business and industry, including research collaborations with the university faculty and external training. The university works with established corporations and small startups and does not have any limits on the type of industry it will partner with. Partnerships are funded in a variety of ways, including traditional research grants, industry funding, and funding issued by the state. PU4 does use metrics, and an additional level of vetting for "red flag" issues. The vetting occurs first. That review specifically searches for potential risk areas with the industry. PU4 indicated that if the

review identified areas such as legal action against the company, and that if the review indicates the industry does not "treat its employees and the community well" then the university will not partner with the industry. If the industry passes the initial vetting, the university then uses a matrix that evaluates "the tenets of partnership" before agreeing to the partnership. Initially, the partnership must align with the university's R1 mission. PU4 could not share the specific matrix, but was willing to discuss it in general terms, noting that alumni status, the financial solvency and health of the business and how well the partnership aligns with the university's research focus and expertise are all categories the matrix considers.

PU3 engages in a variety of partnerships as well, including traditional technology transfer arrangements and research partnerships. PU3 also noted that the university's advancement council and individual colleges and schools may engage in partnerships with industry to secure university funding or, in the case of individual colleges and schools, curricular changes that would benefit students entering that profession. PU3 noted that when a business or industry contacts the university about a possible partnership, there are no set standards or metrics the university applies to evaluate the partnership. Instead, PU3 described a "gut gauge" in which the university considers the project, and the industry and tries to mitigate any possible conflicts. PU3 asks the industry about their previous partnerships with the university, if those exist, and also what that industry's plan is for the project over the next several years. If there is a public perception risk that may impact the university's reputation, the partnership is evaluated at a higher administrative level on campus to check for and mitigate any concerns. PU3 also stressed that the partnership has to align with the university's research agenda and mission. Overall, the assessment is subjective, with no standard set of guidelines created or used.

PRU1 is a private university. This particular university has interestingly designed an administrative system which they describe as "proactive." The office is tasked with serving both faculty and industry and actively surveys its faculty to identify research interests, while also researching companies and their needs, in an effort to better match faculty research priorities with prospective industry priorities. This system also formalizes a process that may mitigate potential problems. The administrative system is a central office that helps create a plan for the partnership, keeps notes and records and tracks the status of the potential partnership, and considers faculty needs. The guiding principle for this arrangement seems to lie in the university's mission to ensure that there is public benefit for its discoveries; something PRU1 noted is also a compliance requirement under the Bayh-Dole Act of 1980, which PRU1 noted is designed to "benefit society and create jobs." PRU1 does not have an established set of guidelines or metrics, but evaluates partnerships in several areas, including potential liability risk to the university, the industry's financial capacity to carry out the partnership, and how the partnership would impact the university's reputation. PRU1 uses these evaluations to more or less design risk out of the partnership. If reputation is a concern, for instance, PRU1 focuses on managing any potential conflicts and ensuring they are openly addressed before the partnership is launched. For instance, as noted in the literature review, there is often a culture difference between universities and industry. Industry might prefer to keep research private, whereas universities typically value publishing and disseminating results. PRU1 makes clear to industry that it will not decline to publish discoveries and results; it can be delayed in certain instances, but PRU1 will not agree to a moratorium on publishing data and results. Although PRU1 does not have set metrics, it's administrative handling of these partnerships helps design out any ethical concerns before the partnership takes place.

Analysis and Conclusion:

This research is a work in progress, and research often does not go as quickly as planned; the researchers would have done well to remember that and included an option for e-mail delivery of questions in the original design of the research structure. Interviews are still the preferred method and will still be encouraged, because they provide a more complete avenue to follow up questions and clarity. However, in order to maximize participation and increase the sample size, the e-mail option is a necessity. It is also concerning that so many of the prospective participants did not respond at all to the initial (or follow up) call for participation, leaving the researchers wondering if that is because of time or availability, or an overall hesitance to answer the questions. If it is the latter, the question that is raised is why – why would prospective participants be uncomfortable answering the questions?

In looking at the universities that did participate, there are some commonalities between the types of benchmarks universities use, and the factors noted as risks in the literature. All three of the universities – two public, one private, 2 "large" in terms of enrollment and one "medium," consider factors such as risk, and how the partnership will impact the university's reputation. All three note that vetting industries for potential red flag issues is a concern. All three also note that the partnership's dovetailing with the university mission is a primary consideration. The industry's financial health is also a factor – expressed as a potential risk in terms of partnering with an industry that is not considered financially healthy.

This research is also occurring as North Carolina undergoes a series of changing and challenging issues from the North Carolina General Assembly. In mid March, the North Carolina General Assembly requested information from all public universities in the system on diversity, equity, inclusion, and accessibility related training offered on each campus. In mid-April, House Bill 715 was introduced, which would eliminate tenure for all faculty at public universities and community colleges in the state. The bill also requests information from each university and community college on "non-instructional research," including detailing projects not related to instruction and how many people work on them, the hours spent on such projects, and recommendations to increase instructional time for faculty and students on each campus. There has been little information detailing how these measures would impact non instructional research on campus, but given this project is non instructional in nature, these new efforts by the body that funds public universities in North Carolina may impact how this and other research projects are handled across the state.

This research project continues and will hopefully yield a more complete set of data in the months to come. It will be interesting to note if the full analysis of the data mirrors the preliminary results seen thus far. As the literature suggests, these partnerships are prolific, and in uncertain and ever-changing funding circumstances, will likely become even more critical to universities. As university industry partnerships become even more fundamental to not only a university's funding, but its identity and mission, having a well mapped set of metrics by which partnerships can be judged, and metrics that consider employee centered concerns such as wages, safety and benefits, would be beneficial to not only the university and industry, but the community at large. Doing so fulfils another recommendation from the literature; ensuring that partnerships benefit society as much as they do universities and industry.

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