TECHNOLOGY INSOURCING IN A UNIVERSITY SETTING

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Abstract

Traditional models of university technology transfer focus on transferring faculty-developed technology from within the university to outside corporations. We propose a novel insourcing paradigm whereby universities bring outside companies into a university setting in exchange for research funding, equipment purchases and faculty consulting fees. Universities hold excess capacity in the form of faculty consulting bandwidth. This faculty consulting can be hugely valuable to private technology companies. In return, these companies supply the university with a variety of value in the form of physical and intellectual capital as well as a variety of opportunities for students.

Keywords: Technology insourcing, Technology transfer, University insourcing

1.0 Introduction

Technology commercialization is a lucrative enterprise for many United States universities. According to the University Transfer Managers (AUTM) 2010 survey, US universities licensed 4,284 technologies in 2010, and collected a total of $2.4 billion in royalties, equity exits and other income.

Past inquiry and implementation of University technology commercialization have focused on the transfer of technology from within the University to outside industries. Within the current research, a widespread model of technology transfer has centered on University investment in intellectual property, predominantly patents, that can be licensed out to private companies, returning a sales-based royalty fee to the University. More recently, research (Bray, Lee 2000) has led to increased

awareness of superior returns related to specific arrangements within technology transfer. Accordingly, while total license income increased 3.0 percent in 2010, cashed-in equity increased 160 percent.

As noted by some, (Jenson, Thursby 1998) prior to the Bayh-Dole Act, the vast majority of university inventions did not see commercialization. University faculty simply do not have the time and resources required to bring their inventions to market. However, inventor involvement is necessary for the long term success of such technology commercialization. To ensure ongoing alignment of incentives between the licensee and the inventor, license fees are typically split between the university that sponsored the research and the inventor. By giving individual inventors a stake in future royalty payments, these inventors have a clear reason to maintain involvement with the technology even after it has been transferred out of the university. This motivation is crucial to successful technology transfer. As detailed in previous work (Thursby, Thursby 2004), university technology is unlikely to successfully transfer out of the university without ongoing support from its original inventor.

University research depends heavily on publicly funding programs from the National Science Foundation (NSF), the National Institute of Health (NIH) , and the National Endowment for the Humanities (NEH). These resources are under constant threat from the waxing and waning of the federal budget. It is important that universities develop innovative models of insourcing in order to supplement these public funding sources with private investment. An innovative model of technology transfer may offer a model that smoothes these gaps in funding and adds significant value to the research ecosystem within universities.

In this paper, we propose a novel conceptual model of insourcing intellectual property into a university setting. In this model, rather than transferring technology from the university to outside corporations, we propose bringing outside intellectual property into the university setting. These outside technologies will gain tremendous value from the underutilized faculty consulting resources available at a university.

2.0 Literature Search

The relevant literature on university insourcing is broken into three categories: 1. Insourcing discussions as a response to outsourcing; 2. Technology transfer discussions; 3. Private funding of university research discussions. A brief discussion of these three areas of inquiry will build the broad understanding necessary to discuss novel university insourcing paradigms.

2.1 Insourcing

The challenges of insourcing have been discussed in the literature. While the cost savings of outsourcing are often elusive, management may have trouble swimming against the current of the outsourcing trend among senior executives (Hirschheim, Lacity 2000). Furthermore, there is often significant risk associated with large institutional outsourcing (Schniederjans, Zuckweiler 2004). It is often difficult to identify which practices should be outsourced or insourced. There is evidence that many practices increase firm value when insourced (Qu, Oh, Pinsonneault, 2010). The terms"outsourcing" and "insourcing" have inspired a range of definitions over the years. Given the ambiguity of these terms, a continuum of meaning may be a more appropriate when deriving a definition (Bergstra, van Vlijmen, 2010). It is therefore a primary aim of this paper to delve into the associated meaning of the term "insourcing" from an impartial viewpoint.

3.2 Technology Transfer

Studies such as the Association of University Technology Managers' (AUTM) Licensing Activity Survey have detailed the significant returns generated by some of the United States elite universities. During FY2010, 4,284 technologies were executed, with a $2.4 billion returned to universities in the form of royalties, equity exits and other income. Trune and Goslin took this AUTM data to analyze the profitability of university research in a broad sense — accounting for technology transfer office costs, patent costs, new research grants, and royalties due to licensing agreements (Trune, Goslin, 1998). The study found that only 48.8% of technology transfer offices operated at a profit when all factor were taken into account. While the majority of universities do not turn a profit, some turn rather sizable profits — a few, greater than $21 million. The study also found that these technology transfer offices had an average contribution of $2.37 million to surrounding communities. There has also been significant research on the effects of institutional and organizational variation on the return of Technology Transfer Offices within universities. Siegel et al suggest that faculty reward-mechanisms are a crucial factor in predicting favorable returns for universities (Siegel, Waldman, Link, 2003). This may be due to a moral hazard problem as well as the embryonic state of these early-stage technologies (Jensen, Thursby, 1998). Sponsored research may alleviate these issues but do not solve the issues of moral hazard (Jensen, Thursby, 1998). Others have discussed the effect of private needs and activities on successful university relationships. Thursby and Thursby found that the level of privately sponsored research was related to a firm's basic research activities, while licensing relationships were predicted by a prevalence of personal contacts between the two institutions (Thursby, Thursby, 2008).

2.3 Private Sponsorship

Private sponsorship has had an enormous impact on university research. There is significant benefit to private sponsorship in the form of research, equipment and postdoc funding. There has been a virtuous cycle related to such investment — creating excess benefit that is used across universities. However, this outside influence is considered by many to be a double edged sword (Montaner, O'Shaughnessy, Schechter 2001). The role of private funding in university research can have serious and unforeseen effects. There is concern that the increasing presence of private corporations in clinical trials of pharmaceutical drugs — while reducing costs for private companies and increasing research funding — may be redefining the rules of engagement within these fields (Davidoff et al. 2001). Some have found that private sponsorship of clinical trials may result in biased results, due to selective reporting or publication of low-quality papers that support the wanted results (Djulbegovic, et al 2000).

3.0 Novel Model of Insourcing

Research question:

Will technology insourcing return additional value to research universities?

University insourcing will be defined as follows:

The process by which a university brings outside companies into a university setting in exchange for research funding, equipment purchases and faculty consulting fees.

Private companies are particularly good candidates for insourcing. Private companies require flexible and scalable resources in order to develop technologies and reach markets. Capital efficiency and scalability are both absolutely critical for companies. These two, often contradictory, needs are incredibly difficult for companies to balance. One area of critical importance for companies is in gaining expert knowledge. Companies are often not able to afford leading experts. Furthermore, the appetite for risk of leading scientists may not be a good fit at some private companies. Startup incubators and accelerators such as TechStars and Y Combinator do a great job at lowering the barrier to entry for technology companies by supplying top-quality mentors in the areas of consumer and enterprise information technology.

Universities are in a unique position to supply the specific expertise needed by private companies. Universities have an abundance of expert knowledge in the form of faculty consulting. The ability to supply expert consulting in an affordable and scalable manner would be hugely valuable to companies.

By bringing in outside intellectual and financial capital into the university, companies add to the innovation ecosystem of university research. This is tremendously value-additive and in alignment with most university missions. University insourcing may also bring in further grant financing previously unavailable to university researchers. Many federal grant programs place importance on commercialization — insourcing is a way to address this need.

The following model describes a method for insourcing private companies that will utilize underutilized faculty consulting to add significant value to companies and return financial and intellectual value to the university and its students.

University insourcing provide 3 fundamental elements to private companies.

1. Matching faculty consultants with startup needs
2. I.P. consulting and funding
3. Increased recognition for companies

Universities receive 3 fundamental elements from the insourced companies.

1. Research funding and equipment
2. Consulting revenue
3. Education and professional opportunities for students

4.0 Visual Model

What follows is a brief description of the included visual model depicting the process of value creation within university insourcing.

University resources holds underutilized resources in the form of faculty consulting hours. In this model, insourced companies gain access to faculty consulting, which fuels creative innovation. In many cases, this consulting increases further the innovation within the faculty member's own research, creating a virtuous cycle of increasingly innovative research. In most cases, the faculty will also receive consulting fees. This increased innovation is also likely to attract additional grants to university.

In exchange for faculty consulting, an insourced company may offer its university a stake in its future revenues as well as its current equity. Future revenues will be paid back to the university in the form of royalty payments. Universities must be careful to structure such an agreement in a way that does not strangle a company. Mechanisms such as a grace periods or leveraged royalty scale (whereby the royalty % increases as total revenue increases) should be considered. These royalty payments are then distributed

between both the university and the faculty members who provided consulting. The other form of ROI takes place during a liquidity event. The university may choose to sell its equity stake, returning capital to the university and its stakeholders, or it may choose to retain possession in the acquiring company or public company. The university will also gain tremendous value from the consulting fees, and research funding, equipment purchases and student opportunities provided by private company involvement.

4.1 Fundamental Premises

- Universities carry underutilized faculty consulting bandwidth
- Faculty have interest in working with private companies
- Universities are willing to explore novel insourcing paradigms
- Insourcing will increase ROI for Technology Transfer Offices

5.0 Methodology

Six policy makers in Vermont were engaged in a series of semi-structured interviews.

Open Questions:

a. Is your university open to new types of insourcing?
b. Is there a precedent of insourcing at your university?
c. What new models would you be open to?
d. What obstacles do you see?
e. What are the greatest opportunities related to insourcing?

Rank the following statements from 1 to 5 according to:

1. *Strongly Disagree*
2. *Disagree*
3. *Neutral*
4. *Agree*
5. *Strongly Agree*

Scaled Questions:

a. Our university is considering new models of insourcing.
b. Faculty consulting holds unfilled capacity.
c. Insourcing has potential in increase university ROI.
d. Insourcing is feasible within your university.
e. Insourcing is attractive to your university.
f. Universities should explore novel insourcing paradigms.
g. Outside company activities add value to university research.
h. Insourcing would stress capacity at Tech Transfer Offices.
i. If so, TTOs would be interested in growing to accommodate

extra demand.

j. Universities should be careful not to take on too much insourcing.

6.0 Results

The six interviewees are anonymized and abbreviated with initials: AB, BC, CD, DE, EF, and FG. All interviewees hold, or have recently held influential positions at Vermont colleges and universities.

6.1 Open Questions

The first portion of interviews consisted of open questions in which the interviewees were asked to give an account of current activities and interests at their own universities.

Q1. Is your university open to new types of insourcing?

All interviewees were generally open to new types of insourcing — however, the level and area of interest differed. Some responded that, while they were open to any new model that would increase ROI at the university, they were not actively exploring new models of insourcing. BC said, "We are always willing to look at new models. Especially if it doesn't cost anything. Everyone is looking to tweak methods for improvement." Some respondents remarked that if new models of insourcing were able to bring value to specific areas they would be especially enticing. BC said to this question, "Absolutely. Especially if there is an educational element." CD mentioned that the university was looking into novel ways to fund research — smoothing out the ups and downs related to federally financed programs.

Q2. Is there a precedent of insourcing at your university?

All six respondents identified some precedent of insourcing at their own institutions. Examples included biomedical research funded by pharmaceutical companies, collaborative research, and student consulting projects for outside companies. Privately funded research examples tended to be tied to work of specific individuals — faculty or administrators, while student-related projects tended to be institutional relationships. FG pointed out that student consulting projects provide huge value to students in forming career-driven skills and also to local businesses that have trouble finding, and affording consulting work. DE's institution had a similar program, "Every student usually completes 2-3 group projects during their undergrad years, with their senior one a requirement to graduate. They are across the board and not just hard core engineering (music, business, as well as biomedical, gaming, etc)."

Q3. What new models would you be open to?

Respondents were open to a variety of new models. The strongest interest was in new models of insourcing that would benefit the students directly — adding valuable research experiences and career opportunities. While most individuals were wholly open to exploring new models, it was not as clear that institutions' interests were open to change. DE's institution is exploring models where outside corporations approach the university, who then sets up teams of students and faculty with the right attributes for the proposed project.

Q4. What obstacles do you see?

Respondents identified a variety of obstacles. The most common obstacle was related to institutional inertia. CD was concerned that faculty interest may be an obstacle. University faculty and departments have been optimized over the years to garner federal funding. Privately funded research is foreign to many, and therefore buy in to insourcing may be difficult. For many, insourcing is not a well understood avenue and for others it is simply not attractive. Another obstacle may be related to intellectual property. AB and DE identified IP issues as a major obstacle for university insourcing. BC discussed that obstacle may differ, depending on the needs of companies — for some time and space may be constraints. FG highlighted obstacles caused by asynchronous schedules of private companies and universities; many businesses have specific needs over the summer, when students are no longer available.

Q5. What are the greatest opportunities related to insourcing?

Discussions of opportunities centered around benefits for students and university research. DE mentioned that the interaction of private companies with students creates tremendous job opportunity. Often, students acting as consultants are hired after projects are finished. FG mentioned that student and business interests are closely aligned — both are able to leverage insourcing to gain tremendous learning experiences. BC discussed the benefits related to increased creativity and interdisciplinary connection. CD discussed the benefits of university research that is more closely aligned with private sector needs — creating a more sustainable research enterprise and offering skills to students that are closely fitted to private sector needs.

6.2 Scaled Questions

	AB	BC	CD	DE	EF	FG	AVG
a. Our university is considering new models of insourcing.	5	4	5	4	4	5	**4.5**
b. Faculty consulting holds unfilled capacity.	4	5	3	5	5	5	**4.5**
c. Insourcing has potential to increase ROI.	5	5	5	3	4	4	**4.3**
d. Insourcing is feasible within your university.	5	5	5	4	4	4	**4.5**
e. Insourcing is attractive to your university.	5	2	3	5	4	3	**3.7**
f. Universities should explore novel insourcing paradigms.	5	5	5	5	4	5	**4.8**
g. Outside company activities add value to university research.	5	5	5	5	5	5	**5**
h. Insourcing would stress capacity at Tech Transfer Offices.	2	3	2	2	3	3	**2.5**
i. If so, TTOs would be interested in growing to accommodate extra demand.	3	3	2	3	4	4	**3.2**
j. Universities should be careful not to take on too much insourcing.	2	3	2	2	4	3	**2.7**

7.0 Discussion

The results of both the open ended and scaled questions display a strong interest in university insourcing among participants. While we expected to find interest in university insourcing, the level and scope of interest were remarkable. Some interesting findings worth discussing are: return on investment, variability in participants' definition of terms, student engagement, barriers to insourcing and the role of technology transfer offices.

7.1 ROI

There was agreement among respondents that university insourcing is

likely to increase ROI for university research. ROI was defined by respondents to include financial, physical, and intellectual capital. External opportunities for faculty and students were also considered to be a substantial source of ROI.

7.2 Definitions

The proposed definition of university insourcing — the process by which a university brings outside companies into a university setting in exchange for research funding, equipment purchases and faculty consulting fees — was used to frame the discussions with participants. The definition was purposefully broad in scope in order to allow for individual interpretation. This helped to expose the individual and institutional definitions and usages of the term. Participants tended to define insourcing at their own universities in three specific ways. The first definition that we encountered is related to the insourcing of funds — public or private — to fund university research. Universities are able to "insource" research that would have previously been done elsewhere. This can include anything from specific, privately funded projects to large public funding mechanisms. The second definition covers the process by which universities will insource all or part of a private company — bringing the company onto campus — interacting directly with faculty and student teams. The final definition describes the process by which a private company will hire the university to build a consulting team of faculty and students to delivery a specific project. While all three definitions broadly fit the model of insourcing proposed in this paper, each is unique and requires university resources and attributes.

7.3 Student Engagement

Student participation in insourcing was a common area of interest among respondents. Within all three definitions of insourcing described above, student involvement played an important role. Student engagement in university insourcing is perceived to add value in the form of research opportunities, job-specific skills and job placement. Job opportunities and industry-specific skills are increasingly important to both undergraduate as well as graduate students.

7.4 Barriers to Insourcing

The data show that universities are seriously considering new models of insourcing. Furthermore, insourcing is perceived to be highly feasible and to offer significant ROI to universities. Interestingly, insourcing is not perceived to be a stressor on technology transfer offices. Given these results, we might expect participants to strongly agree with the statement, " insourcing is attractive to your university." However, participants response

was tepid — at 3.7/5.0.

Participant interviews revealed that there are two reasons for this: university flexibility and faculty interest. While novel insourcing paradigms may interest individuals within a university, they may be difficult to implement if they are not aligned with the university's organizational inertia. There are many stakeholders and pivotal players that play a role in such a type of institutional change. Organizational alignment of interests and buy in from these players is crucial to implementing university insourcing. Participants were skeptical of such conditions at their own universities.

The second major barrier is related to faculty acceptance. The prevailing model of publicly funded research is a strong motivator for university faculty. Faculty often feel that they do not have the time or interest to interface with private sources of funding. Furthermore, there is an ongoing concern about the moral hazard related to private funded research. For these reasons, faculty buy in is a serious barrier for some models of university insourcing.

7.5 The Role of Technology Transfer Offices

Technology Transfer Offices (TTOs) will likely play an important role in the implementation of insourcing systems. However, respondents do not expect insourcing to bring significant stress to TTO operations. While there may be many reasons for this, the implication among participants was that insourcing would not be a tightly controlled mechanism for the TTOs, but rather a medium through which faculty, students and private companies can effectively collaborate.

8.0 Conclusions

This exploratory search into novel insourcing paradigms within a university setting is intended to open the discussion and definition of the concept. These initial data have shown that there is significant interest within universities for novel forms of insourcing. Furthermore, we have begun to detail the returns, opportunities, channels, and barriers related to university insourcing. Further study is necessary to refine the scope of definition and broaden the sample of university stakeholders. While this survey has begun to peel back the outside layers, we are left with many more questions about the future of university insourcing.

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