Knowledge-based Partnerships Provide Strategic Opportunities: building an infrastructure for solutions and leadership

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Executive Summary

A new era of knowledge production and use is upon us. In this new era, leading organizations will be those that excel at solving society's most vexing challenges effectively and efficiently. Identifying those barriers and uncovering the knowledge needed to remove them will require transdisciplinary knowledge partnerships. Organizations whose infrastructure best supports broad knowledge-partnerships will be sought-after partners as we strive to improve life on Earth.

Two key characteristics of this new era are:

1. Valuable knowledge resources are held in many sectors beyond academia; and
2. Research funding landscapes are changing.

In order to take advantage of these changes, new institutional structures specifically adapted to the following challenges must be created:

- ***University expertise is distributed*** - Winners in this new environment will be able to rapidly assess their current knowledge portfolio and to efficiently assemble transdisciplinary teams of experts who co-produce assessments of knowledge needs.
- ***Incentive structures are variable*** - Cultures that place high value on outcomes-oriented fundamental research will gain advantage by attracting scholars who can solve complex problems in transdisciplinary environments.
- ***Transdisciplinary advances are co-produced*** - Barriers to social, economic and environmental progress will be most effectively identified through ongoing and mutual exchanges among experts from diverse backgrounds; institutions that do this best will be the most sought after as knowledge partners.

In addition to the challenges above, leading institutions will have infrastructure that recognizes heterogeneity of need across the knowledge partnership landscape. One typology of that landscape has three types of engagements:

1. One-off applied questions;
2. Strategic questions specific to a firm;
3. Pre-competitive fundamental research specific to a sector or sectors.

At the University of Minnesota we have early experience managing knowledge partnerships; we are also well positioned geographically to build on our experience. A robust knowledge partnership infrastructure will have the following characteristics:

- ***High level coordination and partnership management*** - We need a high-level organizational element that spans hierarchical levels and works to create conditions where bottom-up and top-down activities are in sync. This is the metaphorical lobby where new and existing partnerships are greeted, offered concierge services, and ushered on to the next phase of their development.
- ***Program level specialization that reflects strategic priorities*** - As we explore the capabilities, interests and needs of potential external partners, we will find that there are topical groupings with similar challenges and barriers. Our organizational structure should be designed to identify such groupings and respond to commonalities; it should also respond to ebbs and flows in internal and external strategic priorities.
- ***Dedicated staff at the program level*** - Stewardship of knowledge partnerships is as important as stewardship of our philanthropic partners. If we are to build fruitful and lasting intellectual connections with entities beyond the University, we must devote time and human & institutional resources to those conversations and exchanges.

Introduction

With the recent sesquicentennial of the Morrill Act, and with growing scrutiny of public universities by state legislatures, the land grant mission is a strong presence in the evolving relationship between public universities and stakeholders in their surrounding society. It is clear that large state research universities have important roles to play in local and regional economies, but the exact shape of the role is not clear.

In addition to complex signals from state lawmakers, the nature of many of our state's economic sectors is changing. Schumpeter's creative destruction and Nelson and Winter's evolutionary economies are operating at unprecedented speeds while institutions such as ours struggle to keep up with, and anticipate the, at times, titanic changes occurring beyond our borders. In this rush of innovation and change, strategies become uncertain. With that uncertainty comes opportunity.

The University of Minnesota can be proactive in shaping a new role for knowledge institutions by placing increased value on outcomes-oriented fundamental research and in parallel ensuring that our curricular and co-curricular offerings are in line with the workforce needs of the Greater MSP region. This paper focuses on research and in particular on creating infrastructure to support outcomes-oriented research through knowledge-based partnerships with firms outside of academia. The emphasis reflects two things:

1. ***Valuable knowledge resources are held by potential partners*** - While Bell Labs is long gone, this does not mean that there is not a large store of knowledge and wisdom held in the private and public sectors in our region and beyond. In a resource-constrained environment, we will gain more insight if we avail ourselves of the full breadth of complementing knowledge and understanding that can be gained through partnerships with other institutions.
2. ***Research funding landscapes are changing*** - The paradigm of individual creativity that shaped our current problem-choice norms is rooted in historical circumstances very different from today. In an overly simple sense, at the time of *Science - The Endless Frontier* there were more resources than there were problems; hence it made sense to chase all ideas. Our current situation is the inverse; there are more ideas than there are resources; hence we cannot pursue all ideas and our resource allocation must be more strategic.

Expanding our knowledge partnerships will enhance UMN-scholars' ability to articulate new kinds of questions, and in answering those questions both satisfy scholarly curiosity and clear away fundamental barriers hampering the evolution of our society. Working with partners on research efforts is not new, but its urgency is growing; furthermore, such collaborations have historically been highly applied (or at least viewed as such). There are now increasing opportunities for fundamental research that also addresses real business concerns.

While keeping up is challenge enough, a bigger danger at this point is that we not think big enough to get out in front of the ongoing changes. Given the large changes that have occurred in regional economies, the rapid changes in demographics and technology, and increasing need for evolution in our workforce, it is very likely that the U will benefit from developing new institutional structures to shape and catalyze the innovations that can make us a leader in knowledge-based partnerships.

Two Current Efforts

As is oft-stated, the Greater MSP region is a tremendous place for interactions between academics and leaders and innovators from important firms and sectors of the global economy.

Ongoing examples of two end-member approaches to capitalizing on this regional advantage are:

Centrally organized

Our region is home to a wide range of companies that are important forces in the global food system; in parallel, the U has evolved strong capacity related to all aspects of food production and distribution. Leaders from the University and from the University of Minnesota Foundation have organized a series of conversations between University leaders and leaders from a range of private sector companies with strong interests in the food system. The objective of these conversations has been to identify areas of overlapping interest and to begin to think about frameworks that will allow outcomes-oriented partnerships to form and flourish.

Locally organized

The Institute on the Environment (IonE) has two programs that have built strong outcomes-oriented partnerships with private sector firms (other organizations within the U have surely done the same). The partnership efforts in IonE have focused on particular resources and capacities (global land use and corporate sustainability). These efforts originated as laboratory-scale initiatives and have been supported with resources from IonE discretionary and research accounts. While both IonE efforts have some characteristics of traditional industrial affiliates models, they differ in important ways from the classical model in the details of both research articulation and financial arrangements.

The two examples above both address the global food system and are engaged with many of the same partners, yet for all intents and purposes they are operating independently. In many ways they represent the differences between top-down and bottom-up organization. Clearly we need both, but we also need to ensure that we avoid conflicts in strategy and that we maintain maximum bandwidth and flexibility in our interactions with external partners. As interactions such as these become a larger part of the U's strategy, we will need to implement new mechanisms to support partnerships and ensure coordination. We are trying to do something new; hence it is entirely likely that we will need to invent some new processes and best-practices to support that innovation.

Challenges that should shape our innovation

In order to be successful in our expanding knowledge partnerships, we will need to address some challenges presented by the current state of our scholarly culture and norms. These challenges include:

- ***Distributed nature of University expertise*** - Consider the example of the Food Industry round table. The leadership of that group within the university is drawn from three colleges with historically strong interactions with the food industry. In addition to the faculty in those colleges, there are a large number of faculty whose work is related to food, but whose departments are among our remaining 10 Colleges. This situation is duplicated many times over in areas such as sustainability, renewable energy, community development, etc.
- ***Variability in incentive structures*** - In some departments, working directly with industry scientists on applied problems is the norm and garners respect; in other departments, not so much. As the portfolio of our interactions with external partners grows, we will encounter great heterogeneity in local norms regarding what is considered "important" work. Similarly, there will be cultural differences in incentive structures between our partners and ourselves.

- ***Co-production of knowledge needs*** - This is touched on above, and it is central to our success. If we are to expand the pool of our faculty who are engaged in true partnerships with external partners, we will need to develop mechanisms and processes to shape the questions that are asked by those partnerships.

A typology of questions

There will be a range of knowledge creation needs that can be addressed through collaborative work between academic and private sector experts. Some of these are continuations and expansions of collaborations that have occurred in the past; and some of them will require development of new processes and modes of engagement to optimize the outcomes of the partnership.

- ***One-off applied questions*** - This is a mode that is well established in some parts of the university. In this mode a firm needs well established knowledge applied to a specific or novel situation. The firm with need provides a faculty member's lab with funds to support, say, a masters student to perform the work. This work is quite specific, well scoped by the funder and time bound. It provides localized support for research groups that already align well with the needs of a specific firm or sector.
- ***Strategic questions specific to a firm*** - As labs across the university have developed global databases focused on issues of strategic concern to private sector firms, opportunities for engagement with firms with overlapping interests have increased. As conversations with such firms continue, areas where University databases and analytic tools can shed light on specific strategic challenges are often illuminated. These engagements are typically bilateral. They provide firms with expert advice and they provide researchers with questions and suggestions for new areas of peer-reviewed research. Much of the IonE Global Landscape Initiative's (GLI) engagement with private sector partners has this bilateral flavor. In the case of GLI, work is done *pro bono* and offers of payment are deferred with the suggestion that the partner should provide a philanthropic gift if they are so inclined.
- ***Pre-competitive fundamental research*** - Industry affiliate groups complement the bilateral form engagement described above. Traditionally such groups have been pay-to-play and engagements with the affiliates have been in the form of early access to research results. The NorthStar Initiative for Sustainable Enterprise (NISE) has experimented with an alternative to the traditional affiliates model by engaging partners in the articulation of the research agenda and through very close relationships regarding data and knowledge exchanges. NISE partners have contributed to a fund that supports the program as a whole, but financial participation is not mandatory. As might be expected, the most active participants have been consistent contributors.

As an institution, the U should be able to engage in all three of the models outlined above; furthermore, we should have an infrastructure to ensure that the most appropriate relationships are efficiently developed in the context of the strategic objectives of both the UMN and our partners.

The classical applied / basic spectrum for classifying research does not quite capture the variation represented in the set of question-types above. While the first category fits well in the traditional applied category, the other two examples have important elements of desired

outcomes that shape the questions that are asked.[1] Some of this outcomes-oriented research will also have an applied flavor, but many questions, especially in the third category, will involve fundamental research. Institutions that excel at addressing important questions that in turn open up new economic and intellectual domains will emerge as leaders in the coming years and decades.

Keys to success

At the University of Minnesota we have examples of each of the types above, but all of these engagements operate largely independently. The feedback that we have received and that resulted in the Food Industry Roundtable indicates that our current efforts are not meeting the needs and desires of our potential partners as fully as they could. Moving closer to our potential will call for improvements on several fronts.[2]

Coordination

As we are seeing with the Food Industry Roundtable, and hearing in many anecdotal reports, an area where we can dramatically improve our effectiveness is in coordinating our engagements with our external partners. To those who have spent large parts of their careers within academia our highly decentralized functioning seems normal and is seen as a strength, but to those beyond our borders our lack of left-hand / right-hand coordination is often baffling. Our external knowledge-based partnerships will be enhanced to the extent that we can assemble interdisciplinary teams and ensure that we are not inventing the wheel in parallel in separate parts of the U.

Accessibility

A corollary to the coordination aspects of our decentralization, is the challenge that our external partnership pools face in finding the right people to engage with. We often hear from our partners that it can be very difficult to find the individuals or labs that are best suited for the questions that they have. As we seek solutions to increasingly complex challenges, the issue of accessibility will also become more complex. It will entail not simply finding an individual, but, in some cases, identifying and assembling a team that does not yet exist.

A corollary to this challenge is that multiple contact points can develop for related problems within a single company or college. This leads to confusion and is an inefficient use of resources on all sides of the partnership (this is a corollary to the coordination point above).

Responsiveness

Another trite but true element of partnerships is that the time frames of our private-sector partners are often different (e.g. shorter) than the norms in academia. As one moves from problems that are fairly applied to those that are more fundamental, the time frame disjoint becomes increasingly strong. As we achieve successes in our partnerships, the demand for engagement will increase. We will need to ensure that we have roles defined and staff in place to ensure that as demand grows our reputation for professional engagement also grows.

How can we organize ourselves?

The organizational structure of the U, and most universities like us, reflects the historical importance of reductionism and disciplinary specialization. This model has been staggeringly

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[1] e.g. Stokes, Donald E. 1997. Pasteur's Quadrant : Basic Science and Technological Innovation. Washington, D.C. : Brookings Institution Press.

[2] None of what follows is rocket science or particularly new. It is stated here for completeness of the argument.

productive and successful in removing barriers to improvements in the human condition. As human ability to modify our environments has advanced, the challenges that we are trying to address have become increasingly complex and the outcomes of our interventions increasingly difficult to predict. And we are finding that the simple disciplinary organization of our universities is not very efficient at engaging with such complexity. [3]

A corollary to this is that university knowledge production has historically been dominated by internal considerations. With the exceptions of a small number of fields, our focus has been on knowledge that we hold and create internally; universities as a whole have traditionally had very little interaction with knowledge from other sectors. [4]

As the examples above indicate, here at the U we have begun experimenting with approaches to address the increasing need to be able to address challenges that have U-wide breadth and to take advantage of knowledge needs and resources in sectors other than our own. On the organizational front we have created new cross-cutting entities such as the Institute on the Environment and the GPS Alliance. While these new structures are cross-cutting, their primary focus is internal and on catalysis of new knowledge production and providing enhanced administrative efficiencies.

A few small scale experiments have been done regarding organizational structures for bridging between university knowledge activities and those of other sectors, but we have not yet attempted anything at the full scale, or large subset, of the University. If we are to effectively address the growing need to form knowledge creation and exchange partnerships with non-academic organizations, our own institutional structure will need to evolve. Some of this organizational evolution will be intellectual, but large parts of it will be management innovations related to the expansion of our cross-boundary functions.

While it is very likely that organizational evolution will greatly enhance our capacity to catalyze outcomes-oriented fundamental research activities, the precise structure of such new institutional elements are yet to be designed. That said, there are a number of conceptual elements that are likely to be present in whatever structures we implement:

- ***High level coordination and partnership management*** - An overarching organizational goal is to ensure that the creativity of our faculty and staff is not stifled, but at the same time that the strategic objectives of the University as a whole are met. This requires a high-level organizational element that spans hierarchical levels and works to create conditions where bottom-up and top-down activities are in sync. Similarly there is real work that needs to be done to ensure that interactions in all parts of our knowledge landscape are in sync (e.g. if we have multiple connections to individual external partners, then the same (or at least similar) signals are being transmitted along each channel.) This element should be proactive as well in developing new partnerships that would contribute to our overall strategic objectives.
- ***Program level specialization that reflects strategic priorities*** - As we explore the capabilities, interests and needs of potential external partners, we will find that there are some obvious divisions. The figure in Appendix I suggests distinction between the ongoing MNDrive activities and a possible theme focused on corporate sustainability. As we move forward we are likely to develop a portfolio of knowledge partnership

[3] The emergence of biochemistry departments is an example of this. Should it be placed in a college with the natural sciences? or in the medical school? In smaller institutions is it part of the biology or chemistry departments. Examples of all of these solutions can be found; at some institutions more than one instance can be found.

[4] Engineering departments are the exception here that proves the rule.

domains that we consider quasi-independently. It is also likely that some domains that are currently quite important will fade with time. Our organizational structure should be designed so that it can evolve with the ebb and flow of our strategic objectives.[5]

- ***Dedicated staff at the program level*** - Stewardship of knowledge partnerships is as important as stewardship of our philanthropic partners. If we are to build fruitful and lasting intellectual connections with entities beyond the University, we must devote time and other resources to those conversations and exchanges. Sub-elements of our overall strategic portfolio will have differing (although not necessarily non-intersecting) partnership communities and we should expect that the professional expertise necessary to maintain relationships in each will vary accordingly. In the IonE we employ PhD and professional staff whose primary responsibility is managing our collaborations with our private sector partners. These positions have been crucial to our intellectual engagement externally and it is hard to imagine a successful public / private partnership infrastructure without such dedicated resources.

Knowledge-based partnerships must be mutual

Many of the challenges in our financial relationship with the State can be traced to mistaken ideas about the mission and benefits of a leading research university and confusion about how our mission differs from other types of academic institutions (e.g. liberal arts colleges, teaching universities and technical / community colleges). We share some characteristics with many other types, but differ in the central role that fundamental knowledge production plays in our culture.

With this in mind, it is as obvious as it is imperative that our partnership building efforts not result in our research enterprise becoming glorified consulting. It will be necessary to bring discipline and creativity to our thinking about how best to finance the needed knowledge partnerships. It will be vital that they be rooted in mutual trust and respect; and they must be nurtured through genuine conversations toward mutually-owned research agendas.

To fully achieve this within our own community it will be necessary to enhance the value that our culture places on research that has external drivers and that is solutions-oriented. Just as Pasteur put himself in a position where he needed to discover the germ model, we will need to enhance norms and develop organizational structures that encourage our scholars to engage with research questions that open new paths to improving the economies and environments beyond the boundaries of our campuses.

Funding models are evolving

As Federal research funding has become more conservative and has declined as a factor in stimulating innovative research, and as the opportunity costs of pursuing such funding continue to rise, the University's strategies regarding resources to support ground-breaking research needs to evolve. Both the funding of the research and of our research infrastructure are under considerable stress. Going forward, it is unlikely that Federal funding will be a strong driver in the growth of our overall research portfolio.

Stimulating knowledge-based partnerships can also be a strategy toward developing new models of research funding. As our outcomes-oriented portfolio grows, so too should the financial commitment of those who will benefit from the new knowledge. As noted above, the

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[5] It is important to note that this infrastructure need not be bureaucratic. Much of it can be done through data mining and associated informatics tools.

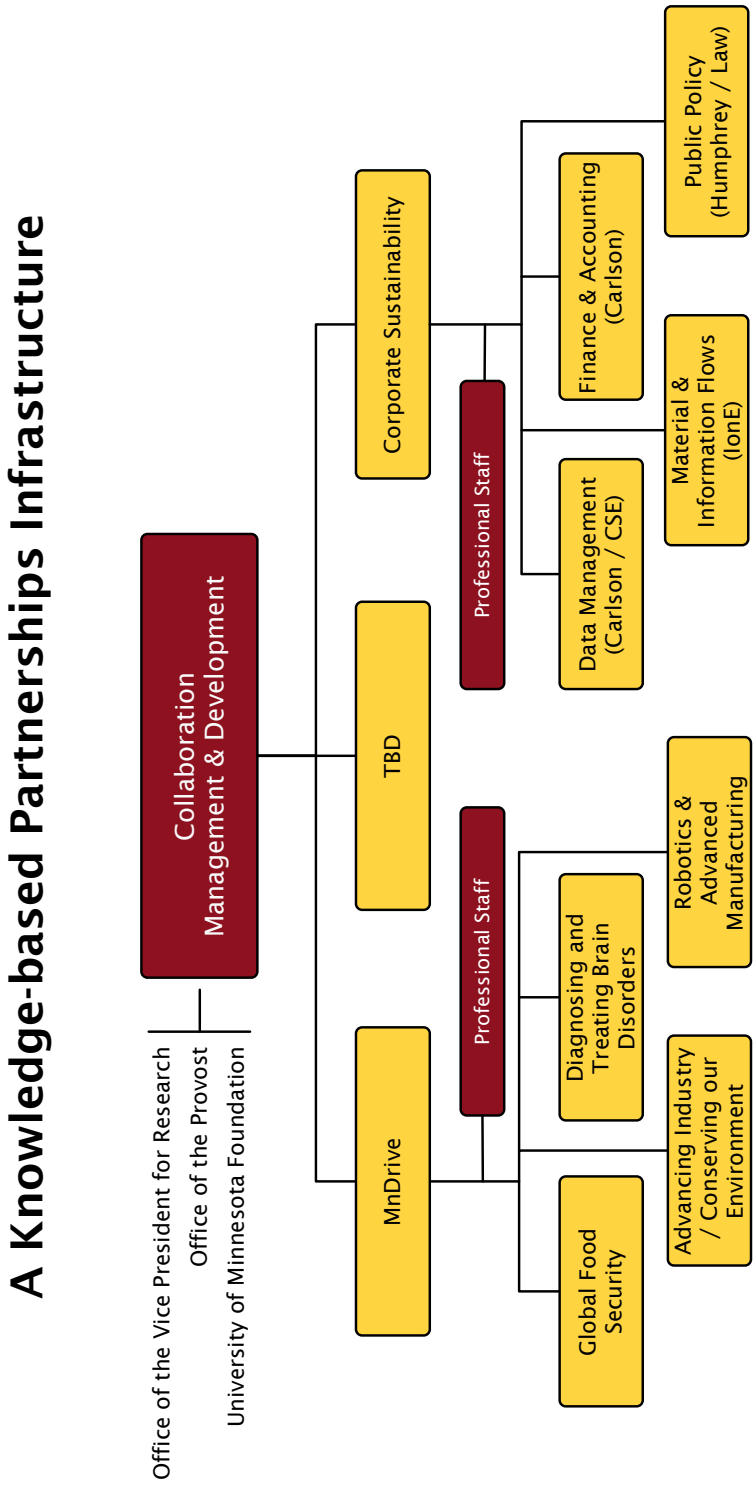
IonE is developing new funding streams related to its partnerships and we are seeing growth in our funding related to these experiments.

The current state of our innovation infrastructure is such that there is an opportunity to invent a new, solutions-oriented research enterprise. Imagine a hybrid of the purely public nature of the University and the purely private nature of Bell Labs. Such an institutional model would bring flexible teams of world-class researchers to bear on problems that remove barriers to development with funding that reflects the risks and benefits of such work. Such a model would bring the benefits of Bell Labs-like research not just to individual companies, but to entire sectors. Individual firms would have the benefit of world-class research without having to bear the full costs and commitments of creating their own long-term research infrastructure. University researchers would have access to new resources and inspiration that will allow them to be active participants in the shaping of societally-relevant research agendas. The problems that become available to them will be among the most challenging and will reflect the full complexity of our social and natural systems.

Next Steps

If we decide that we want to pursue the opportunities that knowledge partnerships and outcomes-oriented fundamental research present, then we should experiment with some pilot activities. As new realms of knowledge-based partnerships evolve, they may reach a scale where University-wide management becomes a management advantage. The diagram in Appendix I suggests that there may already be areas where we can experiment with the development of infrastructure to add value to partnerships. Identification of one or more such areas and investment in some pilot efforts is a way to move forward and to better assess the risks and benefits of institutionalizing such capacity.

Appendix 1


A Knowledge-based Partnerships Infrastructure
Office of the Vice President for Research
Office of the Provost
University of Minnesota Foundation
Collaboration Management & Development
MnDrive
TBD
Corporate Sustainability
Professional Staff
Professional Staff
Global Food Security
Advancing Industry / Conserving our Environment
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Data Management (Carlson / CSE)
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Finance & Accounting (Carlson)
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