

CHAPTER 5

University-based Innovation and Social Equity “Putting the moccasins back on the feet of our youth”

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INTRODUCTION

The dizzying rise of social media, new technologies and globalization over the past 25 years have had a profound impact on the world, raising standards of living to unprecedented levels, but also creating ever more sharply distinctive classes of “haves” and “have nots”. This growing social inequity has, in turn, led to enhanced political and societal tensions. We see this clearly playing out in recent elections around the world, as well as within institutions of higher learning. Much of the relevant debate on college campuses in the United States, for example, has become far too acrimonious. Rather than openly seeking larger-scale and more effective solutions to deal with these rising tensions, we have tended to struggle defensively with managing the processes of the divisive discussion itself. Code words and code phrases are regularly used to polemicize and polarize the debate, with proponents often talking over or past each other. Fundamental societal co-benefits, such as student safety and freedom of expression, are often pitted against one another fruitlessly. This is an essentially modern conundrum that we are dealing with almost daily in academic leadership in the US.

This contribution is intended to be a modest thought piece on how large, research-intensive universities such as the University of Illinois System might better deal with the underlying disease at play here (i.e., widening societal

inequities), while still accelerating the benefits of an increasingly technological and global society. How should we frame our response to this challenge? I believe that it comes down, at least in part, to the development of a new model of university-based technological innovation — one that has an explicit “full-cost accounting” standard for assessing the benefits of such innovation, moving beyond the more limited standard that is too often the entire focus: enhancing wealth creation by pointing to successful lucrative university spin-offs and/or more simply counting patents and disclosures.

MOTIVATING BACKGROUND

I recall participating in a broadcast debate at the time of a NASA satellite launch event I attended in the 1990s between myself and a very distinguished Native American elder. As the Principal Investigator for an instrument on the spacecraft, I suspect I was there to represent “high technology”, and my interlocutor was there to represent his tribal community and its cultural underpinnings. I recall being bemused the first time he told me that “we must put the moccasins back on the feet of our youth”. But, after hearing him repeat this statement several times over the course of our conversation, I finally realized that he was espousing a complete return to a more harmonious and humanistic “pre-technological” existence. I responded that I personally believed that — realistically — there were simply no places left on our planet that were sufficiently pristine to which such a retreat could be made, and that we were stuck with science and technology (S&T), for good and/or ill, into the foreseeable future. I suggested that the path forward to address the acknowledged negative effects of modern science and technology could only be found through exploring yet new layers and applications of S&T, making sure to design these new layers for direct public benefit and human welfare. Looking back, I do not believe that I prevailed in this debate — this gentleman was incredibly impressive!

Ever since that experience, however, I have used the moccasin metaphor in talks I have given. I have become firmly of the opinion that we must indeed return these moccasins, albeit only symbolically, by purposefully supporting the optimal and equitable application of knowledge and technology to expand human welfare for the many, not just for the few. For me, the expression now means intentionally reducing the number of “have-nots” while also increasing the number of “haves” — to reach that more harmonious place where human wellbeing writ large and wealth generation go together hand-in-hand.

This will be a massive task. Just one sobering statistic from my own experience will illustrate just how far away we are from investing adequately in social-equity-building S&T research and development. It comes from analysis

of our response to the climate change challenge, which is clearly one of the most important ones that we face. Human-induced climate change is already disproportionately harming enormous numbers of people living in socio-economically disadvantaged regions. One would think that, as such, there would be a strong priority given to research and development (R&D) designed to mitigate (or create adaptation strategies for) the worst effects of climate change — a field sometimes called “global change research”. As vice chair for strategic planning for the US Global Change Research program in 2012 and as a founder of the international collaborative global change research effort known as the Belmont Forum (n.d.), I was in a position to estimate with some accuracy the total world-wide governmental investment in research associated with global environmental change. The number at the time was somewhere between \$10 billion and \$15 billion annually, with the US still acting as the most significant funder of global change research in dollar terms, primarily due to its significant space sector. This number can be readily compared with the approximately \$50 billion in harmful effects of Super Storm Sandy on the US Eastern Seaboard on one day in October 2012. The cost of damage from this major storm, quite possibly related to climate change, is seen here to dwarf the entire global change research budget for our planet! The dollars lost during this one day, with one storm event, occurring in one region, would have been sufficient to fund the entire global change research program around the world for more than three years! Certainly, and in hindsight, some of these damages could have been mitigated through steps taken to increase the resiliency of the Eastern Seaboard to such events — which are now predicted to occur with increasing regularity and/or ferocity into the future.

It follows that, if we are to find a way to make appropriately robust investments in new knowledge creation and innovation to extend and preserve prosperity and safety, available governmental and federal dollars are probably and will remain insufficient. We must, therefore, find a way to harness private resources together with governmental and public resources to attack the major problems of our time. The facilitating role of large public research universities in all this will be pivotal.

At a land-grant university system such as the University of Illinois, the two sides of this particular public-private coin are both elements of the mission and date back to the very essence of the idea that emanated from the 1860s. The originating impetus “To promote the liberal and practical education of the industrial classes in the several pursuits and professions in life” was a wonderful, principled and ultimately wildly successful idea. It provided an affordable, high-quality education for the many, while also creating new knowledge and disseminating ideas that have, over time, built prosperity and, indisputably, transformed global society.

This land-grant model is still very successful today. In a brief example from my own university system, we calculate that just 25 of the many companies founded by U of I (University of Illinois) alumni are today worth over \$75 billion and employ over 220,000 people! And we have a tremendous list of legacy contributions — my current favourite example being the development of indoor air conditioning — think for a moment of the impact that has had on people living in the southern part of the US and therefore the population density in that region!

We now need to “turbo-charge” this successful land-grant model and bring it to bear on the critical socio-technical problems of our time by connecting university-based research yet more vigorously with commercial activities in support of the public good. The balance of this paper describes some of the elements of an approach to do this, based on our work at the U of I System.

A NEW MODEL OF UNIVERSITY-BASED INNOVATION?

A re-energized model of university-based Innovation can perhaps begin to address these questions. In fact, one could posit that large, research-intensive university communities, with their commanding interdisciplinary reach and access to both talent and capital, are possibly the only places where such a modern model can emerge rapidly. It is only at large research universities that the intellectual adjacency exists to enable the full span of disciplinary knowledge to be activated synergistically (i.e., the biophysical sciences and engineering, the social sciences and, most importantly, the arts and humanities).

Firstly, then, we should understand what there is to learn from the current “best of breed” models of innovation.

Classic and successful innovation ecosystems that one can study from around the world are typically closely associated with research universities. Examples most often cited in the United States include Silicon Valley, Research Triangle Park and the Kendall Square developments in Massachusetts. The reasons for these successes are fairly obvious. The access to talent and talent mobility, the ability to experiment rapidly and extend new technologies, and the ability to attract sustained venture capital are all factors providing some of the built-in advantages. These and other global models (e.g., Singapore’s innovation system driven by its semi-public entity A*Star, the Fraunhofer Institute in Germany, and models in Finland, Japan, Israel, etc.) all show the importance and relevance of a well-regulated and vibrant innovation sector to national prosperity.

Singapore provides perhaps the most compelling example of the connection of innovation to human wellbeing. In this small country, per capita income has increased fourfold from \$20,000 in 1980 to more than \$80,000

today. And over the same time period, the life expectancy of the population has increased from 71 to 82 years, a gain of more than a full decade in roughly 40 years!

Common elements can be discerned among these successful models of innovation. In addition to the proximity of research-intensive universities, diverse commercial interests and financial capital, we see a strong connection to urban settings. Access to amenities and job mobility are important characteristics, as well as the presence of the more youthful “creative classes”. Younger people are known to be more willing to take on challenging entrepreneurial activities with energy without being inhibited by the personal financial or reputational risks involved. For example, a plot of total entrepreneurial activity measure is seen to peak in the 24-35 age range (Sasaki, Global Entrepreneurship Monitor, n.d.)

So what does this mean for our plans and attempts to drive innovation forward in the context of a modern version of the land-grant movement? A comprehensive Venn diagram comes to mind: with specific petals related to: interdisciplinary research-intensive universities; multi-sector (small, medium and large) industrial firms; high-capability and readily-accessible computational and networking systems; rapid-prototyping possibilities with access to larger-scale markets; access to sustained capital; urban settings; access to pleasant amenities and housing catering to younger adults; and affordable living arrangements, enabling job mobility and regular skill-set renewal. An innovation ecosystem — taking advantage of the sweet spot in this (or similar) Venn diagram(s) — should be the intentional goal for the next-generation land-grant developments.

Such an optimized innovation ecosystem, at least in part, must also be driven by a more broadly-based articulation of what constitutes success in university-based innovation — co-designed from the very beginning with the explicit goal of raising social equity through job and education pathway creation. It cannot be merely about wealth creation any more, but the development of lasting — and more pervasive — prosperity and social equity, as well. By co-design, I mean the joining forces of public and private stakeholders in the formulation of both the success metrics and strategy to create full-scope innovation.

TOWARDS A CO-DESIGNED UNIVERSITY-BASED INNOVATION ECOSYSTEM

Next, I sketch out the recent progress made by the 81,000-plus student University of Illinois System — comprised of the University of Illinois at Urbana-Champaign (UIUC), the University of Illinois at Chicago (UIC) and the

University of Illinois at Springfield (UIS) — towards building out an urban and statewide regional innovation ecosystem designed to lift the social equity of the state while simultaneously building prosperity and creating jobs.

A critical requirement for this type of co-design is an extremely close relationship or explicit partnership between academia and industry — in fact usually between specific companies and specific university colleges and/or departments. This must extend well beyond the existence of a simple funding relationship into a parameter space where the mutually-acceptable and essential ingredients are: 1) achievable gains to the bottom line “share-holder value proposition” on the part of the industrial partner; and 2) rich sets of student opportunities for internships, references and jobs on the part of the academic partner. Without this pair of attributes being jointly and simultaneously met, the relationship often degrades into a much more restricted formula for disconnected research funding and talent recruitment. Importantly, if authentic commercial gains are in fact realizable on a timely basis for the industry partner and if authentic student enrichment opportunities are realizable for students (and faculty), then the partnership is particularly well founded. Often, this means that the university side must be prepared to sign non-disclosures and admit liberal intellectual property policies perhaps without immediate expectation of financial return. In turn, the industry side must invest in the educational experiential mission of university students and graduates, and be open to sharing goals for collaborative projects and products and services with commercial potential.

To foster these kinds of relationships, the University of Illinois System has developed an active “CEO Round Table” entity to discuss how to best develop a co-designed and scaled-up innovation ecosystem appropriate for Illinois and the Midwest. The Round Table is co-chaired by the University of Illinois System president and the chief executive officer (CEO) of a leading Fortune 200 company. The group is comprised of approximately 12-15 (typically Fortune 200) CEOs from various sectors, including manufacturing, health care, financial services and information technologies. It meets approximately three times a year and normally invites a leading official from a well-known innovation system (e.g., Research Triangle Park) to describe and present findings from their related work, or alternatively a regional thought-leader (e.g., the governor of Illinois attended the most recent gathering). The Round Table action agenda focuses on multi-variate approaches, including talent development, recruitment options, job creation (including both high- and low-tech employment opportunities), technology transfer and targeted research and development.

One of the Round Table’s first projects was to create an action template for an intensive university-industry collaborative platform, based on a detailed prototype generously developed and shared by Caterpillar Inc., working with U of I leadership. The template describes a process for an in-depth

university-industry executive exchange — basically a half-day intensive interaction between the commercial enterprise senior leadership (CEO, chief information officer, chief financial officer, chief technology officer, chief strategy officer, etc.) and appropriate senior leadership from the university (president, chancellors, deans, key faculty, etc.). The purpose of the executive exchange is to share and discuss industry needs and university capabilities in a “rapid dating” approach, leading to the identification of several work streams for promising follow-up by key experts from both sides. Our experience to date through five such executive exchanges with different corporations has been that it is always possible to identify exciting low-hanging fruit in these kinds of interactions suitable for intensive follow-up activity.

In addition to the work of the CEO Round Table to build the needed public-private partnering, the fundamental principles for such a co-designed innovation ecosystem must build from the public academic values of access, affordability, credential completion and success in civil society.

For the University of Illinois System, access is a key component, helping to enable promising students from many disparate backgrounds to gain a world-class education no matter their family financial circumstances. Specifically, the U of I System has committed institutional funding that more than doubles combined resources from federal (Pell grants) and state (Monitory Assistance Program) funds to provide additional financial aid to socio-economically disadvantaged students. In 2016, for example, the U of I System provided more than \$65 million in such additional financial aid, enabling a historically high level of racial diversity among the student body, both enriching the student experience for all students while providing important opportunities for diverse participation.

College affordability and a vigorous degree completion agenda are also key principles for this work. With the growing national concerns in the US related to student debt, the U of I System has frozen tuition for in-state students for three years in a row to ensure that average debt levels remain well below national averages. Also, with high degree completion rates — both 4- and 6-year baccalaureate completion rates are well above national averages — the U of I System boasts of graduating large numbers of students with relatively low student debt. There is more to do on this agenda, but an important start has been made.

The success agenda requires that the university work hard beyond graduation — not only for alumni fund-raising purposes but also to provide opportunities for graduating students to engage directly with private companies and find satisfying jobs, enabling strong upward social mobility, not just for the students themselves, but for their families and communities. With more than 20,000 graduating students per year, the U of I System provides a rich resource for private sector recruitment in all fields and for all possible interests.

Finally, the co-design requires rethinking the role and nature of a university campus — or more precisely perhaps what might be called an innovation district — in an urban setting. We have developed conceptual plans for what we now call a “live, work, play, study, prosper” innovation district, located near downtown Chicago. Such a campus would need to have “open walls” to surrounding communities for job creation and full community participation. Amenities and affordable housing would be needed, co-located near appropriately outfitted laboratories and offices, all fully network-enabled and supporting a mix of public and private activities. Faculty and students would work together with experts from commercial companies (small, medium, and large), as well as teachers from the public-school system to enable a diverse family of rich experiential learning opportunities settings designed for and conducive to vibrant innovation.

In closing, it is my belief that the large, public, research-intensive university of the future must go well beyond its traditional mission of providing world-class educational and research outcomes. It also must also link — significantly more effectively than in the past — with communities and private sector partners to build the societal equity that is becoming such an urgent issue in modern times. Putting these moccasins back on the feet of our youth is both part of our public responsibility and in our own pragmatic interest.

REFERENCES

Belmont Forum (n.d.). <http://www.belmontforum.org>

Sasaki Global Entrepreneurship Monitor (n.d.). <http://www.gemconsortium.org>