19 Remaking the Innovator Imperative

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Does America need more innovators? We posed the question to highlight how innovation has become a national imperative pursued through the transformation of people. Societal goals such as regional development and international competitiveness take shape through initiatives to make innovators. Contributors have shown that such programs are ubiquitous and pervasive. Innovator initiatives target all age groups and career stages, from kindergarteners to senior scientists. Innovators train in formal and informal educational settings, supported by public and private funding. The innovator imperative operates at all scales, from individual garage inventors to interdisciplinary teams, regional innovation districts, and global federations.

But asking the question implies doubt. It calls attention to the fact that the demand for innovation is at a crossroads. The contributors to this volume join journalists, policy advocates, and scholars in challenging the assumptions and impact of innovator initiatives. They have demonstrated that innovation training programs are historically prone to failure, they have questioned the efficacy of supposedly universal models, they have documented gender and racial disparities across the enterprise, and they have argued that innovation—once a means for solving societal problems—has become an end unto itself.

Finally, we inquired about the need for innovators to open a dialogue about the purpose of innovator initiatives and whom they serve. We assembled champions, critics, and reformers to explore innovation's contradictory dimensions; to engage practitioners directly; and to do so via a reflective approach that treated participants symmetrically. Contributors collectively contextualized the assumptions, goals, practices, and consequences of the demand for innovators. This dialogue fosters opportunities for seeing how the imperative can be remade.

What Drives the Imperative?

The volume's contributors reveal several reasons why the call for innovators enjoys widespread support. Innovator initiatives thrive because they promise to cultivate the skills, mindsets, and human capital needed to address broad societal challenges. How, for example, should future generations of children learn to live and work in a digital age? How can companies, universities, and governments successfully develop new technologies in a global market? How can local communities, regions, and nations achieve cultural growth and economic prosperity?

Innovator initiatives offer reproducible methods to solve these societal challenges across interconnected scales. Programs featured in this book teach *individuals* to acquire change-management skills, to bring an idea to market, or to cultivate a mindset for lifelong creativity. These personal objectives support *organizations* as they seek advantage over competitors or as they enhance opportunities for once-excluded populations. These institutional interventions support *the nation's* reform efforts: they produce millions of young coders, incubate thousands of start-ups, and generate technological breakthroughs that will maintain international competitiveness. These methods provide a sense of empowerment and control. Across all levels, innovation experts contend that with the right people, the rights models, and the right technology, society's thorniest problems can be solved.

Stakeholders with very different motivations pursue innovator initiatives united by a broad vision of innovation as progress achieved through social and technological means. These programs, in turn, generate different ideals of the innovators they seek to produce. The image of innovators as young, cosmopolitan risk-takers first codified in the 1950s is still dominant among many champions of innovation. However, the programs featured in this volume demonstrate a dramatic expansion of who counts as an innovator.[1] Indeed, a key tenet of the imperative is that anyone can innovate.

A small set of powerful institutions, however, underlies the imperative's democratic ethic. A "triple helix" of government agencies, large corporations, and elite research universities provide funding, expertise, and direction to the innovator imperative.[2] As the creator of policy and through granting agencies such as the NSF, the federal government is the major sponsor for most innovator initiatives.[3] High-tech companies such as Google and Microsoft and research universities such as MIT and Stanford

also drive the imperative in a symbiotic relationship with the government. Philanthropies such as the Kauffman, Lemelson, and Sloan Foundations are yet another important contributor. These institutions even underwrite the research of innovation's critics and reformers; indeed, nearly all of the contributors to this book have received such support.[4] Pro-innovation organizations do not speak with one voice; however, the hundreds of institutional signatories on the AAAS's 2015 report, "Innovation: An American Imperative," reveal an increasingly shared vision.[5]

Innovator initiatives operate with the urgency and mindset of a social movement. Champions of innovation define their cause in opposition to some unmet social need or untenable situation with the status quo. Initiates recruit others to the cause through personal contact and media campaigns that highlight how individuals can make a difference. They develop a distinct vocabulary and worldview through formal training and rituals.[6] Lastly, they are guided by the faith that they will change the world. This righteous optimism is the innovator imperative's driving strength.

Consequences of the Imperative

The demand for innovation produces energetic students, new technologies, and regional economic growth, but it also generates a series of undesirable consequences.[7] Contributors to this volume demonstrate that the growing critique of innovation coalesces around three overarching concerns: hegemony, inequality, and hubris.

Champions of innovation portray themselves as insurgent outsiders, but innovation is a widely supported ideology with significant cultural and institutional impacts. As described above, innovator initiatives succeed with the support of major corporations, research universities, the federal government, and philanthropic foundations. These interests have helped to disseminate the language, methods, and models of innovation. One consequence of this proliferation is that when innovation-speak describes everything, it can mean nothing. More insidiously, innovation's aura of progress and empowerment frequently is deployed to obscure the free-market ideology of various institutional reforms. For example, research universities now boast of engineering entrepreneurship courses, technology transfer offices, and student-led pitch contests. Similarly, the NSF increasingly has turned from basic science toward technology commercialization. Innovation can exist in

all political and economic systems, but the growth of innovator initiatives often reinforces a neoliberal vision of progress that exacerbates inequality.

The innovation economy is hampered by profound gender, racial, and economic disparities.[8] These disparities are rooted in centuries of racism and discrimination but are reflected and structurally reinforced at every step in the personal formation of innovators, from STEM education to unconscious bias and harassment in the workplace. Moreover, job losses due to automation and other innovations are disproportionately borne by women and people of color with lower incomes and education levels. Finally, the allure of economic growth leads localities to invest in innovation and to defer maintenance, a strategy that sometimes creates middle class jobs but can leave poorer communities saddled with failing infrastructures.

Champions of innovation display several varieties of hubris. First, they engage in technological solutionism, a naive optimism in the power of innovation to solve any problem.[9] Second, innovation experts assume the efficacy and replicability of their toolkits and recipes, from the "MIT model" to the LUMA Institute's human-centered design methods; however, experience shows that these "best practices" are not universally applicable. Third, in their zeal for disruption, innovators' can become overconfident and forget that innovation is an inherently risky enterprise that often ends in bankruptcy, layoffs, and failure.

As critics of innovation level these judgments, they sometimes adopt a negative, polemical stance that matches the optimism and fervor of innovation's most evangelical champions. Critics risk their own hubris in dismissing the motives of innovator initiatives and the efficacy of methods such as human-centered design. Similarly, by characterizing all pro-innovation initiatives as fraudulent or as tools of neoliberalism, they ignore the complex motivations that draw people to innovator programs and the outcomes they produce. Nevertheless, oppositional critique is valuable and necessary because it has the potential to reshape the innovation enterprise.

Remaking the Imperative

Can the tensions underlying the innovator imperative be reconciled? Society benefits from citizens who have the confidence, expertise, and acumen to generate beneficial technologies, challenge outdated dogmas, and contribute to economic growth. But innovation is not a panacea. At its worst,

the innovator imperative perpetuates racial and gender inequality, misallocates resources, and produces arrogant, irresponsible innovators.

Reformist contributors to this volume present strategies for engaging the trade-offs inherent in the innovator imperative, which we have characterized as critical participation.[10] These reformers integrate scholarly critique with reflective practice to intervene in the training of innovators. Critical participants value complexity and promote questioning in order to combat issues of power, inequality, and hubris. Their goal is to help would-be innovators avoid blindly pursuing innovation as an end in itself; rather, they ask for whom, and to what ends, innovation is deployed. This process of questioning, critique, and iterative reform encourages humility through an appreciation of others' values, because no one person remains the expert throughout the multiple stages of reform.

Critical participation thus begins with a recognition of the complex and even contradictory motivations that attract people to innovation programs. These include awareness of the dialectical relationship between innovation and maintenance, and the complexities in balancing personal empowerment with community support and care. Natalie Rusk's work with the Computer Clubhouse and Scratch is a particularly striking case. Even as it provides individual children with coding skills that MIT, Microsoft, and the NSF demand, it creates child-centered peer communities motivated by self-expression, empathy, and collaboration.

Critical participation involves sustained personal engagement with stakeholders to address the shortcomings of the innovator imperative. For example, to reduce gender and racial inequality in the IT industry, NCWIT collaborates with firms such as Intel and Facebook to implement inclusive practices, such as unconscious bias training, equitable recruiting practices, and mentoring programs. Similarly, social scientists from Arizona State University work side by side with scientists and engineers to encourage the ethical implementation of emerging technologies. These reformers recognize the importance of personal engagement, because sustained social change only occurs when they can be held accountable by their collaborators.

Critical participation involves discomfort and risk. It requires honest reflection about the motivations and moral commitments of one's work. It requires working alongside people with different backgrounds, motives, and values. Those who take on the challenge face internal crises of identity and external hostility. Practitioners may dismiss ethical reflection as a waste

of time, while scholars may label critical participants as sell-outs. Critical participants supported by pro-innovation institutions must also constantly guard against conflicts of interest, capture, and self-censorship. Finally, reformers must be vigilant against regarding "reflection in action" as its own form of solutionism.

We believe that the engagement is worth the risk. This volume has been a critical intervention in the innovator imperative. The outcome is not a cookbook but a set of insights into how the imperative operates, its beneficial and problematic attributes, and how it might be reformed.

Possible Futures

The competing perspectives captured in this volume suggest multiple possible directions for the innovator imperative. In one scenario, a national movement of innovators vanquishes society's "wicked problems" and reduces critics to mere naysayers. Another outcome finds the imperative on its last legs, discredited and irredeemable as governments, universities, and corporations reorganize according to alternative social values. Both of these scenarios seem equally implausible. Innovation-speak likely will wane in the face of emerging critiques. However, the systematic pursuit of innovation is unlikely to subside anytime soon. Educators, legislators, and advocates will continue to call for more innovators, and many of the initiatives presented in this book will grow domestically and abroad.

The contributors to this volume also demonstrate how the innovator imperative already is being remade. As the imperative evolves, it is incumbent on those who cultivate innovators to do so with critical reflection. Through willing exposure to criticism, the leaders of innovator programs and the individuals they mentor can see the limitations of pro-innovation rhetoric and practices. Similarly, we hope that innovation's critics can acknowledge the social needs, progressive desires, and daily challenges of those who educate would-be innovators.

Does America need more innovators? Only if pursued in the service of a different kind of imperative—one that reveals to would-be innovators the assumptions and powers that shape their futures; one that demands the equal valuing of those who care for existing cultures and infrastructures with those who build new things; one that trains scientists, engineers, and

entrepreneurs to anticipate the implications of their innovations; and one that cultivates technologists who approach their work with humility in addition to optimism. We hope those who train and deploy the next generation of innovators heed this imperative. The people they seek to transform depend on it.

Notes

1. There are many different "imaginaries" among innovation's champions, and even starker differences when we look across the spectrum of critics and reformers. In this volume's introduction, we described the work of Everett Rogers, who in the 1950s first characterized innovators as young, cosmopolitan risk-takers. That image remains dominant among many of innovation's champions, including, for example, MAYA's expert design consultants (chapter 4). However, the White House's Jenn Gustetic imagines sixth-graders who search for "debris disks" in space telescope images (chapter 7). Benoît Godin's innovator (chapter 9) is a sixteenth-century religious heretic, while Andrew L. Russell and Lee Vinsel (chapter 13) envision a neoliberal huckster. Natalie Rusk's innovator (chapter 15) is an underprivileged ten-year old, while NCWIT (chapter 17) envisions a woman denied access to a career in IT. On "sociotechnical imaginaries," see Sheila Jasanoff and Sebastian Pfotenhauer, "Panacea or Diagnosis? Imaginaries of Innovation and the 'MIT Model' in Three Political Cultures," *Social Studies of Science* 47, no. 6 (2017): 783–810.

2. Henry Etzkowitz and Chunyan Zhou, *The Triple Helix: University-Industry-Government Innovation and Entrepreneurship* (New York: Routledge, 2008).

3. Mariana Mazzucato, *The Entrepreneurial State: Debunking Public vs. Private Sector Myths* (London: Anthem Press, 2013).

4. For example, all three editors and fourteen of the nineteen contributors have administered or benefited from NSF grants: Fasihuddin, Britos Cavagnaro, Arkilic, Feldman, Pfotenhauer, Cook, Vinsel, Rusk, Carlson, Ashcraft, Sanders, Fisher, Guston, and Trinidad. The volume itself is partially funded by the NSF and the Smithsonian's Lemelson Center, which in turn, is supported by the Lemelson Foundation. We remind the NSF that the project is linked to the broader impacts of NSF award no. 1354121. Any opinions, findings, conclusions, or recommendations belong to the editors and individual contributors, and do not necessarily reflect the views of the NSF.

5. "Innovation: An American Imperative," American Academy of Arts and Sciences, 23 June 2015, http://www.amacad.org/content/innovationimperative/.

6. The NSF I-Corps program, for example, formally recruits previous NSF grantees to apply for the program (chapter 5), while faculty advisors initiate new University

Innovation Fellows during an official and individual induction "pinning ceremony" (chapter 3).

7. The classic example of the exploration of these consequences is Everett M. Rogers, *Diffusion of Innovations*, 5th ed. (New York: Free Press, 2003), 436–472.

8. Several initiatives profess explicit diversity goals, including OSTP's aspiration that the "nation's STEM graduates reflect the full diversity of America" and UIF's emphasis on "strength in human diversity." However, the dismal diversity statistics in the STEM sectors suggest that these and other efforts have been slow to make change.

9. For a critique, see Evgeny Morozov, *To Save Everything, Click Here: The Folly of Technological Solutionism* (New York: PublicAffairs, 2013).

10. For a discussion of the meaning and origins of critical participation see Wisnioski (chapter 1) in this volume.