Dignity, Technology, and Global Order

New Approaches to Complex Challenges

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Washington, DC 2022
Johns Hopkins University SAIS
Foreign Policy Institute

Funded by the Ford Foundation

FORDFOUNDATION

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Washington, DC 20036
https://www.fpi.sais-jhu.edu/

ISBN: 978-1-947661-15-8 (Paperback Edition)
ISBN: 978-1-947661-09-7 (Digital Edition)

Foreign Policy Institute

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Origins and Acknowledgements

The seeds of this project were planted during conversations with Elizabeth Knup of the Ford Foundation about the state and future of U.S.-China policy engagement. Initially submitted to the Ford Foundation as a concept paper in February 2020, the ideas were further refined in extended discussions with Jude Blanchette, Freeman Chair in China Studies at the Center for Strategic and International Studies.

Beginning in the fall of 2020, funded by the Ford Foundation and hosted at the Johns Hopkins School for Advanced International Studies Foreign Policy Institute (FPI), Jude Blanchette, Carla Freeman, and I engaged in research and discussions on a broad range of issues relating to organizational inadequacy in the face of complex challenges and the impacts of emerging technologies on our geopolitical and social futures. Jude provided extensive and valuable intellectual input on the issues of U.S.-China futures, the role of technology, and organizational inadequacies. Carla Freeman was not only a source of substantive contributions in all of these areas, but was also a wonderful FPI project host and mentor.

On the topic of dignity, I am indebted to weekly discussions with Adam Schulman, tutor at St. John's College and former senior research consultant on the President's Council on Bioethics. Dignity is a complex and amorphous topic, and I am grateful for Adam's intellectual guidance and partnership. Our regular conversations were often the highlights of my week. I am also grateful for his eagle-eyed editing. Any remaining errors are mine alone.

We began the project with a roundtable discussion, and are grateful for the feedback from the additional participants:

- Adeno Addis, W.R. Irby Chair and W. Ray Forrester Professor of Public and Constitutional Law, Tulane University
- S.B. Divya, engineer and author of *Machinehood* and *Runtime*
- Francis Fukuyama, Olivier Nomellini Senior Fellow at Stanford University's Freeman Spogli Institute for International Studies, faculty

member of FSI's Center on Democracy, Development, and the Rule of Law, and Senior Fellow, SAIS FPI

- Adam Russell, Chief Scientist at the University of Maryland's Applied Research Laboratory for Intelligence and Security
- Shannon Vallor, Baillie Gifford Chair in the Ethics of Data and Artificial Intelligence at the University of Edinburgh's Edinburgh Futures Institute

To be clear, not all participants share the views in this paper, but all were generous with their time and provided constructive criticism at the outset of the project, some of which I took, and some of which I did not but probably should have.

Many thanks to talented research assistants Jung-Ju ("J.J.") Lee, Ananya Kumar, and Zixuan Fang, in particular for their work on the technology taxonomy, but also for intellectual contributions and support throughout the project. Lauren Maranto at CSIS and Vivian Walker and Shonda Hurt at FPI provided helpful administrative and logistical support. Thanks also to Peggy Irvine for her design and publishing expertise.

Others who provided valuable comments include former Canadian ambassador to China Howard Balloch, who joined a number of us for in-person discussions in Jamestown, Rhode Island, and Peter Mattis and Samm Sacks, both of whom provided thoughtful feedback on earlier drafts. The causes and impacts of techno-sovereignty were originally fleshed out in conversations with Joe Kelly, then at the Crumpton Group and now at the University of Maryland.

I would also like to thank those people that generously gave their time to be interviewed about their experiences running and participating in innovative organizations, including Gerry Rubin of the Janelia Research Campus, David Moss of the Tobin Project, William Tracy of the Santa Fe Institute, and Valerie Chang of the MacArthur Foundation. Credit also to Dominic Cummings, whose blog posts provided timely and important confirmation that these organizations had lessons worth applying to the policy realm.

A final thanks to Johns Hopkins SAIS Foreign Policy Institute. FPI continues to bridge the worlds of academia and policy by bringing together a fascinating group of professionals from around the world. I am grateful to FPI's

new team, Ambassador Cinnamon Dornsife and Monti McCrae, for their continuing support as we closed in on the finish line of this project.

My hope is that this paper can stimulate discussion and lead to the creation of new approaches with which to meaningfully address complex, transnational policy challenges. I believe that any such effort, if it is to be sustainable, needs to be removed as much as possible from current politics, national siloes, and entrenched ideologies, and start with a basic recognition of our common humanity. In the face of rising nationalism, populism, irredentist military adventurism, and a weakened faith in the liberal world order, this is a strategic imperative.

For these and other reasons explained in this paper, I hope that a better understanding of human dignity can inform a better tomorrow for all of us.

Nathaniel Ahrens
March 2022
Alexandria, Virginia

Introduction

Towards a New RAND Moment

We are at a moment of intensifying risk to the global order. The perennial threats to international peace and stability—inequality, economic insecurity, military competition, irredentism, and ideological divisions—are all on the rise. These threats are intertwined with and exacerbated by the profound impacts of emerging and frontier technologies that not only play critical roles in states' security but also have complex, often deleterious, impacts on social equity and equality, human flourishing, and human dignity. Yet governments and the broader policy community have been unable to effectively formulate and implement solutions to these and other critical challenges to global security. New organizational models and mechanisms that can bridge parochial differences and enable creative thinking beyond existing paradigms are needed. This project uses the increasingly antagonistic U.S.-China relationship and the role the two countries play not only as powerful shapers of international relations, but also as influential developers and deployers of emerging technologies, as an entry point to explore new approaches to complex challenges.

A peaceful and prosperous 21st century depends to a great extent on how the United States and China reconcile competing interests and ideologies. As China's political, military, and economic clout has increased, particularly over the last decade, China has begun more actively pushing for a diminution of American power and weakening of the existing liberal order, seeking to reshape global rules in accordance with its domestic interests and institutions. Faced with this "China challenge," the U.S. government has responded reflexively with tactical policy responses aimed at countering Chinese influence and stemming China's rise. As Beijing advances, Washington responds with a counter-policy. The two governments don't seem to have any sort of

common understanding of what a constructive relationship might look like, let alone a roadmap for how they might get there. Without a clear strategic end-goal, this action-reaction cycle makes conflict more likely. Amid growing mistrust between the two sides, flashpoints between the United States and China could become catalysts for global conflagration.

Preventing serious conflict between the two sides, while important, is not sufficient. The degree to which the United States and China cooperate on global challenges will have a major impact on the future of the global order. The world is currently undergoing tremendous social, political, ecological, and technological change. The combined stresses of rising inequality and economic insecurity, exacerbated by rapid technological disruption, have generated social fissures and a broad loss of faith in the existing world order. Illiberal policies and the unanticipated effects of emerging technologies now threaten to fill the void, leaving the global order rudderless, without a clear destination, and buffeted by the tempests of the present.

Yet fixing a strategic destination is not easy. Simply advancing parochial American interests while restricting China's rise is neither feasible nor morally defensible.[1] Even if America's strategy is framed in simplest terms as defending U.S. interests and national security, we still need to answer the critical strategic questions: if we, the citizens of the United States and China, are to live together, how should we do it? What does a workable relationship look like in fifty years? What is a positive and mutually acceptable vision for global order? On which values is it grounded?

Answers to these questions are further complicated by the fact that the international order is not only being reshaped by illiberal forces, but by the unanticipated social, political, and economic effects of emerging technologies. Even a cursory review of the effects of Twitter, fake news, and disinformation campaigns on global politics and freedom of speech serve as demonstration that neither the United States nor other countries are prepared to deal with even elementary technological shifts. We are utterly unprepared for the impacts of synthetic biology, advanced artificial intelligence, quantum computing, the metaverse, ubiquitous data, human-machine interfaces, and other emergent technologies.

1 This is a primarily a commentary on American strategic perspectives. As such, it does not attempt to address all the ways in which China contributes to and should respond to strategic tensions.

Furthermore, as technology and widespread automation make large numbers of workers superfluous, the impact on democracies will be significant, adding further pressures on domestic and global governance. Socially and politically, we are constantly playing catch-up, and technological developments are going to continue to move faster than humans can adapt and cope. Technologies will be channeled by the prevailing ideologies and values of the time.

The economic and national security implications of these emerging technologies are and will continue to be the key drivers of geopolitical rivalry, both between the United States and China and between other states. As each country strives to secure exclusive national technological advantage, the main drivers of innovation and growth—the free flow of people, goods and services, information, and capital—are being constrained by countries' attempts to achieve techno-sovereignty. Policymakers in each country are scrambling to formulate national strategies for critical, emerging technologies, encroaching further and further into the traditional realm of industry. And while emerging technologies are exacerbating national security tensions and blurring the lines between public and private interests, they are also giving rise to fundamental moral questions about the global order, including questions about how to best address inequality, promote human flourishing, and protect human dignity.

In order to assess how we will deal with China over the next fifty or one hundred years and better anticipate how the new technologies we are developing and deploying will shape our collective future, we need to have a vision for a more inclusive and sustainable world order. What does such a world look like? What are the obstacles to achieving it? What impact would such a vision have on technology trajectories, and vice versa? How does the U.S. relationship with China need to change to accommodate this vision? Can the United States and China find common ground based on shared challenges? And, of critical importance, do we have the intellectual infrastructure to effectively digest and address these questions?

The idea that there are global challenges that require U.S.-China cooperation should not be dismissed as mere rhetoric. A precondition for an effective and resilient global order is agreement on common frameworks and norms for governance. In terms of technology governance, the United States and China are only two players, but due to their outsized impact on emerging technology development and global economic growth, as well as their wide

ideological gap, finding a mutually acceptable framework between them is a crucial first test for broader viability. So, while emerging technologies are among the greatest sources of tension between the United States and China, discussions about how to govern these technologies, at both the global and domestic levels, present critical opportunities to create meaningful dialogue. However, agreement on technology norms first requires some common moral and ethical foundation—a shared conception of what it means to be human in the face of technology. At present, the ideological divide and unwillingness of China to even discuss "universal values" complicates engagement. *Finding this common ground is one of the most critical policy issues of our generation.*

Not only do the United States and China lack a common ethical foundation upon which to build normative frameworks, they lack the institutional mechanisms through which to explore them. Domestic political constraints and what famed Xerox PARC computer scientist Alan Kay termed the "tyranny of the present" undermine governments' ability to engage in thoughtful, serious dialogue about long-term cooperation and the future of the global order. Instead, everything is framed in terms of zero-sum strategic competition and security threats**.**

This framing doesn't just limit the ability to address complex, transnational challenges but it also has consequential spillover effects on broader society. As each country positions the other as the main object of strategic competition, the citizens of the other country are essentially stripped of their independent ontological status. As Yale Law School fellow Dr. Yangyang Cheng wrote in *The Guardian*, the constant drumbeat of the "China threat" leads to forgetting that China is more than a "geopolitical concept", that "Chinese people are people" too.[2] And recent attempts in American policy circles to disaggregate the Chinese Communist Party and "the Chinese people," while perhaps well-intentioned, appears more politically expedient than truly humanist.

China, for its part, has a long record of blithely blaming American imperialism and hegemony for a host of domestic and international ills, using accusations of a U.S. "black hand" as a convenient scapegoat. As each country's political elite uses the other to deflect from the root causes of problems and

2 Yangyang Cheng, "The west sees China as a 'threat', not as a real place, with real people." *The Guardian*, October 5, 2021. https://www.theguardian.com/commentisfree/2021/oct/05/west-china-threat-real-place-domestic-agendas.

their own failings, citizens are left with obscured vision of the other's humanity.

Dearth of strategic vision and long-term thinking is not limited to governments. Organizations that comprise the broader policy community, including think tanks and universities, while generally effective at achieving the discrete purposes for which they were designed, operate with funding structures, incentives, and time horizons that are not amenable to addressing complex, multidisciplinary, long-time-horizon, prescriptive policy issues.

The problem is especially acute in think tanks, where the vast majority of China analysts focus on the near-term fluctuations of China policy—such as trade disputes, the Belt and Road Initiative, the South China Sea, Hong Kong, Xinjiang, Taiwan, military-civil fusion, espionage, and influence operations, not to mention the vigorous debate about "who got China wrong." These disagreements and potential flashpoints are important policy issues, but analysis and time horizons are generally more tactical than truly strategic. Without a clear end-goal or vision for the long-term future, these become reactive, narrow responses to a larger strategic problem.

And even those China experts who are thinking more long-term tend to focus primarily on China; they are siloed off from other important trends that are shaping the future, so they still view issues through their own narrow policy lens. In China, these same impediments to strategic thinking are further compounded by the fact that there is virtually no space for open intellectual exploration, collaboration, and truly independent policy analysis.

In order to find more effective organizational approaches to these challenges, there are lessons to be learned by looking at those in other fields where breakthrough innovations were achieved, such as historic organizations like the Advanced Research Projects Agency, Bell Labs, and Xerox PARC, as well as from newer institutions, like Janelia Research Campus—not only from the organizations themselves, but also from the processes that led to their formation.

The Ford Foundation has a deep tradition of supporting such work. In 1948, also a time of geopolitical uncertainty and technological change, the Ford Foundation helped the RAND Corporation spin out of the Douglas Aircraft company with the goal of "furthering and promoting scientific, educational, and charitable purposes for the public welfare and security of the

United States."[3] Later on that same year, anticipating a large increase in funding following the settlement of Henry and Edsel Ford's estates, the Ford Foundation trustees asked Rowan Gaither to form a study committee to write a strategic program plan for the Ford Foundation.

According to the report published in 1950, "The mission of the Study Committee was to make recommendations based upon the best available thought concerning the ways in which The Ford Foundation can most effectively and intelligently put its resources to work for human welfare."[4] The report analyzed issues relating to human welfare and then outlined five program areas that could be pursued in order to advance human welfare. The establishment of Stanford's Center for Advanced Study in the Behavioral Sciences was a direct result of the report.

This project is intended to be a first step on the path to a new "RAND Moment," where an organization is born out of an acute need that is not currently being effectively addressed. This paper lays out the case for a new organizational mechanism, explores a potential framework for a long-term vision and ethical foundation for technology norms and U.S.-China relations, and proposes how such an organization or network could practically advance such work. Key questions addressed include:

- Given that emerging technologies have significant national security implications and serve as accelerants and causes of change, and that China and the United States have divergent ideologies and value systems, how can the two countries (and others) work towards an acceptable long-term future with shared norms for ethical technology development and use?
- As the liberal order shifts and evolves, what principles and underlying beliefs can serve to buttress or improve it? How might the concept of dignity serve as a cross-cultural foundation upon which to engage on ethical uses of technology and inform strengthened principles for global order?

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3 "A Brief History of RAND," *RAND*. https://www.rand.org/about/history/a-brief-history-of-rand.html

4 H. Rowan Gaither Jr., et al., *Report of the Study for the Ford Foundation on Policy and Program* (Detroit: The Ford Foundation, 1949), 13. Hereafter referred to as the Gaither Commission Report, not to be confused with the 1957 Security Resources Panel report, also known colloquially as the Gaither Report.

- What sorts of new intellectual architectures or mechanisms are capable of addressing this and other complex, long-term issues?

While much of this project is focused on the United States and China—their relationship with each other and the future of the global order—the analysis and diagnostics are oriented toward addressing larger issues of long-term thinking and meaningful, cross-disciplinary and cross-cultural dialogue necessary to make progress on complex global challenges. Thus, while progress toward a new vision and mechanism must almost certainly include the United States and China, the aim is to go beyond the bilateral toward broad and diverse international inclusivity.

The Role of Technology in U.S.-China Futures and Global Order

It is not an exaggeration to state that a peaceful and prosperous 21st century depends to a great degree on how the United States and China manage their increasingly competitive relationship. The two countries' respective influence on the global economy, supply chains, finance, technology, global health, and environment and climate, not to mention their military power, means that each has the ability to throttle the ambitions and counter the interests of the other. Beyond the bilateral, this clout extends to their influence on other nations and the global order.

As such, addressing this challenge should be a major focus of politicians, military strategists, policy analysts, business leaders, public intellectuals, and other members of civil society. Yet despite this strategic imperative, over the last decade U.S.-China relations have become more strained and positions more deeply entrenched. Flying the flag of national interest, each country has dug in and focused on how to out-compete the other in geopolitical, economic, and military realms. Competition over emerging technologies and data is at the center of this dynamic.

U.S. and Chinese geostrategic futures are inextricably tied to technological innovation. Efforts to manage long-term relations between these two nations need to factor in the central role that new and emerging technologies play in creating interdependencies, increasing competition, exacerbating frictions, and stoking conflict.

Technology and Global Order

Over the last 70 years, rapid technological progress has played a major role in the pace and scale of globalization—not just the increase in global interaction and integration, but also the allocation of resultant economic gains.

In particular, the acceleration that began in late 1990s with advances in telecommunications, the internet, computing, and health innovation, contributed to broader levels of prosperity and connectivity across the globe. Yet these advances have also led to increases in inequality and unanticipated social stresses. The world is now on the cusp of far more rapid and extensive technological change, with the potential for much greater economic, societal, and military impact.

Technologies that have the ability to reshape economic and national security competition are the crown jewels of the emerging world order. In some circles, including in China, data is being referred to as the "fourth factor of production," with those organizations which can process, analyze, and utilize this data the most rapidly moving important steps ahead of their competitors. Innovations across a wide variety of emerging technologies will reshape almost every aspect of our economy, society, and military. Global and domestic politics will not be immune.

Since the end of World War II, U.S. leadership in science and technology research and development has served as the bedrock of American prosperity and security. This technological leadership position is likely to become eroded, as technological innovation becomes more diffuse and new players, especially China, compete for the commanding heights of these new technologies—technologies which will transform our economies, societies, and militaries. As such, competition over emerging technologies and their concomitant economic and national security benefits will be one of the most critical forces shaping the global order.

The Era of Techno-Sovereignty

Technological competition is already shaping the contours and boundaries of U.S.-China relations. The United States and China are not the only players in this dynamic, but they are at its core. The two largest economies are also the largest players in technological innovation, research and development, start-up company formation, and military technology spending. The U.S. National Intelligence Council captures the situation succinctly in their *Global Trends 2040* futures assessment: "The race for technological dominance is inextricably intertwined with evolving geopolitics and is increasing-

ly shaped by broader political, economic, and societal rivalries, particularly those associated with China's rise."[5]

The American and Chinese governments increasingly view competition over emerging technologies as a zero-sum, first-mover, winner-take-all contest. The most powerful reason for this is the belief that the military applications of these technologies have the potential to offer decisive intelligence and battlefield advantage. A secondary reason is that the economic gains from technological innovations have historically accrued in overwhelming proportion to the innovators and standard-setters, with the rest of the world forced to adopt and follow. Early leads in emerging technologies also allow the locking-in of technology gains, further extending future advantage.

As such, the intense military push for technological advantage coincides with strong domestic economic and political pressures which have only increased in recent years. Beginning in the aftermath of the 2008 financial crisis and accelerating around 2016, in an effort to address festering economic imbalances and societal inequalities, governments have been retreating from globalization and turning inwards, adopting protectionist, neo-mercantilist policies that, on the surface, appear to align well with an indigenous technology development strategy. The upshot of this is that governments are taking an expansive view of national security, with economic security now seen as a key component of national security. Technologies that have the potential to reshape large swathes of military and economic activity have now become top political priorities.

Governments are therefore deeply concerned about the cross-border proliferation of key emerging technologies. The result is a movement towards the de facto nationalization of technology development, a trend we can call techno-sovereignty. Techno-sovereignty is *the emerging consensus among governments that they must assert greater control over technology and trade to ensure their respective national economic and military security*. It is now one of the most powerful geopolitical forces shaping the global order.

China has long been engaged in efforts to develop indigenous technological capabilities to decrease dependence on other countries and to grow

5 National Intelligence Council, *Global Trends 2040: A More Contested World* (Office of the Director of National Intelligence, March 2021), https://www.dni.gov/index.php/gt2040-home/gt2040-structural-forces/technology.

its economy and military. It has done this through industrial policy that forces technology transfer, restricts market access to foreign companies, and, in some cases, resorts to industrial espionage. Over recent years, however, the U.S. government approach to address the threat to American technological leadership has increasingly resembled that of China: build walls to prevent both leakage and penetration. In October 2020, the Trump Administration published a *National Security Strategy for Critical and Emerging Technologies*.[6] This national strategic document combined vague recommendations for strengthening the technology innovation base (such as "encourage public-private partnerships," "develop the highest quality workforce in the world," and "leverage private capital and expertise to build and innovate") with a litany of protective measures targeted at preventing other countries from illegally acquiring U.S. technology. It is clear that the authors spent much more time thinking about how to protect American advantage than how to extend it.

Politically this is the easiest approach, so it is unsurprising to see both China and the United States prioritize building protective walls rather than investing in key innovation ecosystems and infrastructure. It is still too early to see what approach the Biden Administration will take. There has been a greater focus on investing in American infrastructure and "building back better," but economic pressures, security tensions, and election cycles may result in a continuing emphasis on competing with China.

While governments focus on the economic and military implications of emerging technologies, technological change and innovation are impacting human lives and social structures across the globe, irrespective of national boundaries. This creates a dilemma, where incentives to innovate are being driven at the national and firm level, while social effects are shared across broader society. As governments and corporations pursue technological frontiers, who is considering the impact on society and individuals, on human flourishing? What is the social future towards which we are aiming with these innovations? Given the diversity of poitical systems and ideologies, how can societies develop universal norms for ethical technology use? If we take present day techno-sovereign competition to its logical conclusion, how does it affect the global order? How do nations co-exist in such an environment? Do we end up in a Balkanized world of incompatible technology regimes, like

6 White House, *National Strategy for Critical and Emerging Technology* (October 2020), https://www.hsdl.org/?view&did=845571.

that described by S.B. Divya in her visionary novel *Machinehood*?[7] Not taking other countries into account for the moment, in a world in which the United States and China refuse to allow the other access to core technologies, data, and markets, is there a plausible scenario where the two nations do not end up in conflict?

These are critical strategic questions. Yet analysts and policymakers are focused almost exclusively on the near-term national impacts of strategic competition, ignoring or discounting the global spillover costs and long-term sociatal implications. Without a vision for the future and a better understanding of the forces shaping it, technology will drive the future in unanticipated and difficult-to-control ways. Put simply, the unforeseen consequences of technology will have a greater impact on the future of society and world order than governments' best efforts to direct them.

Technology Taxonomy and Military and Societal Implications

It is not enough to talk about emerging technologies in the abstract. A vision for an inclusive global order that promotes human flourishing and reduces the likelihood of conflict needs to start with a clearer understanding of the nature of these technologies and their potential impacts on both strategic competition and broader society. A better understanding of the technologies and their military and societal impacts will also help us appreciate the urgency and complexity of the challenge.

In an effort to think about and visualize these technologies and their impacts in more specific terms, we created an emerging technology taxonomy. We first separated the technologies into five areas: information and communications technology, space technology, biotechnology, advanced materials technology, and earth and energy technology. We then broke these down into specific technologies, derivatives, general applications, and military applications, and looked in detail at their military and societal impact (summarized in Figure 1, page 14, and detailed in the tables in Appendix A).

For military impacts, we focused on force multiplication, advanced weaponry and defense, information advantage, energy advantage, and labor

7 S.B. Divya, *Machinehood* (New York: Saga Press, 2021).

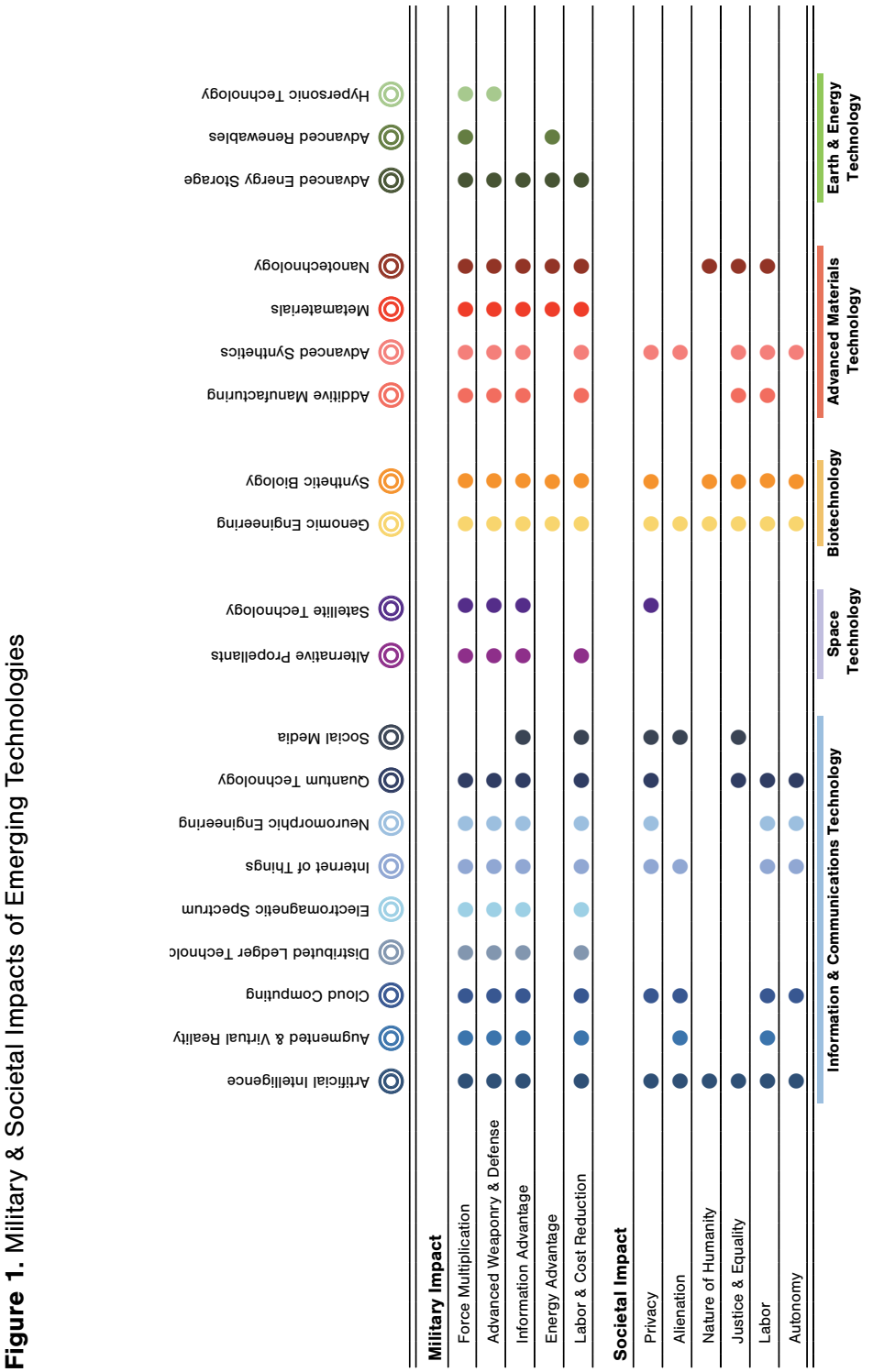


Figure 1. Military & Societal Impacts of Emerging Technologies

and cost reduction (Appendix D). For societal impacts, we looked at privacy, alienation, nature of humanity, justice and equity, labor, and autonomy (Appendix C).

As we categorized and explored the military and societal implications of each technology, a two-pronged conclusion became clear: first, since each of these technologies brings military advantage (with a first-mover advantage to most of them), nations will be strongly incentivized to pursue dominance in each domain. Second, this pursuit will coincide with, and likely overshadow, the negative impacts these technologies may have on society and human flourishing. As F. Daniel Davis observed while serving on the President's Council on Bioethics, "…the claim that all these impressive achievements make positive contributions to human flourishing is misguided and even dangerous… the quest for new knowledge, and for new applications of that knowledge, can be perverted so as to inflict egregious harm on our fellow human beings…"[8]

In light of the lopsided incentives, it is unrealistic to expect governments to prioritize technology governance over development and deployment. *Political, military, and economic advantages accrue in the near-term at the national level, while social ramifications are felt globally and are evident only on a longer time horizon.* This necessitates new approaches to technology governance.

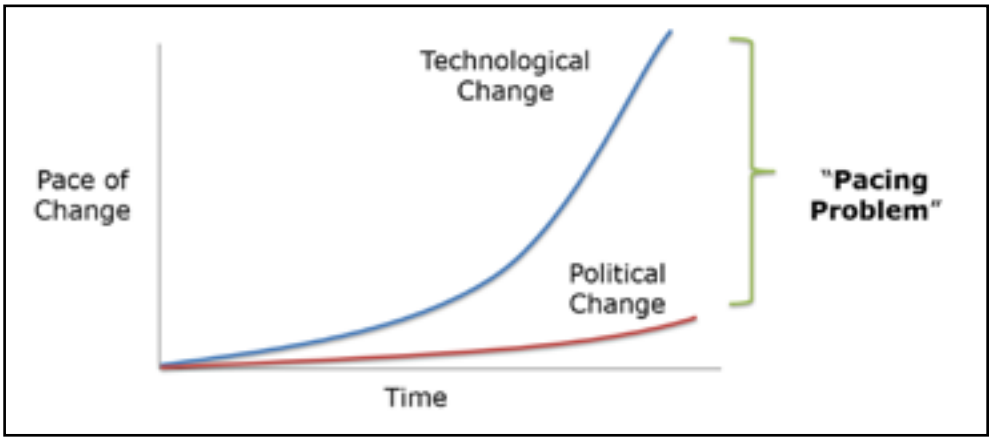
The Challenges to Effective Governance

One challenge to effective technology governance, as discussed above and demonstrated in detail in Appendix A, is that governments, research organizations, and private enterprise have strong incentives to pursue technological frontiers. But another key challenge is a structural conundrum, often described as either the pacing problem or the Collingridge Dilemma (Figure 2, page 16).

The pacing problem refers to the fact that technological development happens much faster than bureaucratic structures and regulators can adapt. The current regulatory approaches from Congress with regard to cryptocurrencies are a prime example. It is unlikely that members of Congress can get up to speed fast enough on regulating cryptocurrencies, let alone understand

8 F. Daniel Davis, "Human Dignity and Respect for Persons," in Adam Schulman, F. Daniel Davis, and Daniel Dennett, et al., *Human Dignity and Bioethics* (The President's Council on Bioethics, March 2008), 31-32.

Figure 2. The Pacing Problem Created by Technological Development



Source: Thierer, Adam. "The Pacing Problem, the Collingridge Dilemma & Technological Determinism," *The Technology Liberation Front,* August 16, 2018.

the technical details of distributed ledger technologies and their broader ramifications. Industry representatives lobby legislators to refrain from regulation for the present, and by the time the technology is entrenched, regulatory efforts are hamstrung.

The pacing problem is not new; it is part and parcel of the nature of technological change. Adam Thierer, of George Mason University's Mercator Center, lists key drivers contributing to the pacing problem as follows:[9]

- Technological driver: The power of "combinatorial innovation," which is driven by "Moore's Law," fuels a constant expansion of technological capabilities.
- Social driver: As citizens quickly assimilate new tools into their daily lives and then expect that even more and better tools will be delivered tomorrow.

9 Adam Thierer, "The Pacing Problem, the Collingridge Dilemma & Technological Determinism," *The Technology Liberation Front*, August 16, 2018, https://techliberation.com/2018/08/16/the-pacing-problem-the-collingridge-dilemma-technological-determinism/. For a more detailed discussion by Thierer, see "The Pacing Problem and the Future of Technology Regulation," at https://www.mercatus.org/bridge/commentary/pacing-problem-and-future-technology-regulation.

- Political driver: Government has grown increasingly dysfunctional and unable to adapt to those technological and social changes.

This conundrum was explored in detail by David Collingridge in his 1980 book *The Social Control of Technology*. The essence of what is now known as the Collingridge Dilemma (which Collingridge himself referred to as the "dilemma of control") is that the social consequences of technologies are hard to predict early in the development stage, and by the time they are better known the technologies have already become too economically, socially, and politically entrenched to control and govern. As Collingridge summarized, "… attempting to control a technology is difficult, and not rarely impossible, because in its early stages, when it can be controlled, not enough can be known about its harmful social consequences to warrant controlling its development; but by the time these consequences are apparent, control has become costly and slow."[10]

We are facing this dilemma with respect to both existing and emerging technologies. Microsoft President Brad Smith was quoted in *LiveScience* as saying that "Artificial intelligence could lead to an Orwellian future if laws to protect the public aren't enacted soon." Smith goes on to state "If we don't enact, now, the laws that will protect the public in the future, we're going to find the technology racing ahead…and it's going to be very difficult to catch up."[11]

Who is responsible for technology governance? Part of the innovator ethos is that innovation happens first, and regulation and governance can be sorted out later, either by government or industry. The attitude in Silicon Valley has been, in essence, "it is our job to build the technology, and, when and only when it is absolutely necessary, it is the government's job to regulate it." Given what we know about the pacing problem and Collingridge Dilemma, and the incentives for technology firms to "move fast and break things," pushing half-baked products to market before someone beats them to it, it does not bode well for taking these broader societal impacts into account. Technology companies will continue to stoke the fires of development, catering to voracious appetites on Wall Street and the military-industrial complex. Pres-

10 David Collingridge, *The Social Control of Technology* (New York: St. Martin's Press, 1980), 19.
11 Stephanie Pappas, "Expect an Orwellian future if AI isn't kept in check, Microsoft exec says," *Live Science*, June 7, 2021, https://www.livescience.com/orwellian-artifical-intelligence-future.html.

sures to innovate, both independently and in service of national interests, will trump thoughtful development in service of human flourishing.

Organizational Inadequacy

If the preceding description of the consequential nature and urgency of these challenges is accurate, why is the policy community failing to actively and effectively address them? One important reason is that overcoming the pacing problem and Collingridge Dilemma is fundamentally difficult. It requires getting ahead of technology and engaging in *anticipatory governance:* imagining desired futures and building towards them from the present. Not only does this necessitate exploring and articulating desired futures, an exercise that runs risks of veering into utopian imaginings, but also considering and including in that process the numerous stakeholders of that future, which often extend beyond national boundaries and may conflict with near-term interests.

But another central reason has to do with organizational failures, or, perhaps more charitably, organizational inadequacies. In order to arrive at new approaches, it is important to first understand the structural limitations and deficiencies of existing organizations and how these contribute directly and indirectly to the lack of attention to long-term transnational challenges.

It is not news that managing competing interests between the United States and China is essential for global peace and prosperity. Since 2012, analysts have been broadly aware of the escalating dangers of a security dilemma, like what political scientist Graham Allison has called a Thucydides Trap, between the United States and China. Over the last five years, the bilateral relationship has further deteriorated to what is now regularly compared to a new Cold War. Experts have offered varying diagnoses of the deterioration, ranging from the increasing authoritarianism of Chinese leader Xi Jinping, to rising nationalism in the United States, to structural shifts in the global balance of power, to the failure of the liberal world order to respond to the myriad challenges of a globalizing world, including financial turbulence, rising social inequality, and accelerating climate change.

Yet with all the organizational expertise that is aware of these issues, the policy community is still doing a poor job at addressing the fundamental long-term strategic challenges, choosing instead to focus on near-term tactical

issues that may, counterintuitively, take us farther from a desirable strategic end-goal rather than toward it. Addressing these near-term policy issues is important, and some would argue should be the primary job of policy-focused organizations, but that doesn't change the fact that these organizations are not effectively addressing critical, long-term strategic issues.

There are a whole host of organizations that could and should be thinking about these challenges, from think tanks and policy research organizations, to universities, to government agencies, to foundations, to independent policy experts and pundits. Each has its own strengths, but none are ideally positioned, structured, or incentivized to address them. Our primary focus here will be on think tanks, those organizations that, on the surface, and often in their stated organizational missions, should be best positioned to diagnose and offer solutions to long-term policy challenges.

Think Tanks

Think tanks have been at the center of the discussion of what and who caused the deterioration of U.S.-China relations and what policy responses the United States should adopt. Over the last three years, scores of related reports, strategies, and articles have been produced by experienced, well-informed analysts at major think tanks. Yet despite this prodigious output, few breakthrough ideas or alternative frameworks have emerged.

The 2019-2020 lead-up to the change in U.S. administrations provided an excellent opportunity to compare think tank views on the U.S.-China relationship. Beginning in early 2019, think tanks began publishing China strategy recommendations, positioning themselves, their experts, and their policies for the new administration. Over the next year, at least ten major reports were issued on how the United States should respond to the "rise of China" or the "China challenge," each with their own take on a "strategic framework."

The Center for American Progress proposed a framework of "limit, leverage, and compete."[12] The Center for New American Security (CNAS) released a government-mandated report that has over 100 recommendations

12 Melanie Hart and Kelly Magsamen, *Limit, Leverage, and Compete: A New Strategy on China* (Center for American Progress, April 2019), https://www.americanprogress.org/issues/security/reports/2019/04/03/468136/limit-leverage-compete-new-strategy-china/.

under the topics of sustaining conventional military deterrence, securing vital U.S. technological advantages, bolstering U.S. economic power and leadership, strengthening American diplomacy, competing over ideology and narrative, promoting digital freedom and high-tech illiberalism, and cultivating the talent to compete with China.[13] CNAS published an additional report entitled "Total Competition" that outlines a strategy to confront China in the South China Sea.[14] The Asia Society published a major report that couches recommendations in terms of "smart competition" with China.[15] The Hoover Institution published a nearly 300-page report recommending "constructive vigilance."[16] The National Bureau of Asian Research published a report calling for "partial disengagement" as an approach to U.S.-China economic competition.[17] The Atlantic Council's report called for "'managed competition' to meet the full spectrum of challenges posed by China."[18] The Aspen Institute published a 170-page collection of essays from nineteen highly regarded experts.[19]

13 Ely Ratner, Daniel Kidman, and Susanna V. Blume, et al., *Rising to the China Challenge: Renewing American Competitiveness in the Indo-Pacific* (Center for New American Security, January 2020), https://www.cnas.org/publications/reports/rising-to-the-china-challenge.

14 Patrick M. Cronin and Ryan Neuhard, *Total Competition: China's Challenge in the South China Seas* (Center for New American Security, January 2020), https://www.cnas.org/publications/reports/total-competition.

15 Orville Schell and Susan L. Shirk, et al., *Course Correction: Toward an Effective and Sustainable China Policy* (New York: Asia Society Center on U.S.-China Relations, February 2019), https://asiasociety.org/sites/default/files/inline-files/CourseCorrection_FINAL_2.7.19_0.pdf.

16 Larry Diamond and Orville Schell, eds., *China's Influence and American Interests: Promoting Constructive Vigilance* (Stanford: Hoover Institution Press, November 2018), https://www.hoover.org/research/chinas-influence-american-interests-promoting-constructive-vigilance.

17 Charles W. Boustany Jr. and Aaron L. Freidberg, *Partial Disengagement: A New U.S. Strategy for Economic Competition in China* (Seattle: The National Bureau of Asian Research, November 2019), https://www.nbr.org/wp-content/uploads/pdfs/publications/sr82_china-taskforce-report-final.pdf

18 Franklin D. Kramer, *Managed competition: Meeting China's challenge in a multi-vector world* (Atlantic Council, December 2019), https://www.atlanticcouncil.org/in-depth-research-reports/report/managed-competition-meeting-chinas-challenge-in-a-multi-vector-world/

19 Leah Bitounis and Jonathan Price, eds., *The Struggle for Power: U.S.-China Relations in the 21st Century* (Washington, DC: The Aspen Institute, 2020), https://assets.aspeninstitute.org/content/uploads/2020/01/TheStruggleForPower.pdf. Of note, one of these, by Robert Blackwill, includes a recommendation for sustained strategic dialogue, stating "there is reason to doubt that either side at present is capable of mounting a serious strategic dialogue, but what is the alternative to giving it a try?" This is a rare case of someone still encouraging high-level dialogue.

The Council of Foreign Relations' January 2020 publication is called "Implementing Grand Strategy Towards China."[20]

Despite often claiming to offer grand strategies, most of these reports focused on the near-term irritants in the relationship, such as trade disputes, the status of Taiwan, the South China Sea, Hong Kong, Xinjiang, the Belt and Road Initiative, military-civil fusion, influence operations, and industrial espionage. Each of them starts from a posture of national, geopolitical competition and aims to provide policymakers with tactical recommendations to seek advantage, often proposing policies that are a direct response to those of Beijing. These reports propose tactics to address near-term competition, disagreements, and potential flashpoints, but lack a clear end-goal beyond "winning" geostrategic competition. It is outside the scope of this project to assess the suitability or effectiveness of these recommendations as they pertain to the current array of challenges facing the bilateral relationship. Many of these efforts yield sensible guidance for policymakers, while others do not. But it is clear that they are recommendations for tactical responses and reactions to China's actions, barely touching upon an end-game or a sustainable, long-term strategic plan.

But is simply "winning geostrategic competition" a feasible, sustainable end-goal? If we carry these tactical policies and vision to their logical conclusions, have we arrived at a desirable place? Can America thrive without a sustainable and inclusive global order? In the face of entrenched, transnational challenges, a go-it-alone approach is inadequate. So, what is the American vision for the world order? More specifically, what is a positive vision that is both attractive to other nations and allows for the securing of U.S. national interests? During much of the 20th century, the framing strategic vision was a liberal world order, based on the free flow of people, information, goods, and capital, that would bring the greatest economic prosperity and political freedom to the greatest number of people. In recent years, numerous articles have proclaimed the failure of the liberal world order, but few have proposed anything to take its place. Limitations and constraints imposed by existing organizational architecture are partly responsible for this difficulty.

20 Robert D. Blackwill, *Implementing Grand Strategy Toward China: Twenty-Two U.S. Policy Prescriptions* (New York: Council on Foreign Relations, January 2020), https://cdn.cfr.org/sites/default/files/report_pdf/CSR85_Blackwill_China.pdf .

In examining relevant organizational inadequacies, the following analysis focuses primarily on the institutional architecture that shapes and governs the types of policy advocacy that ultimately makes its way to the desks of policymakers. This is because what unites most of the current output from think tanks and other policy-related organizations is their relatively narrow, nationalist focus on how the U.S. can gain advantage over China. While this type of guidance certainly has its role, it fails to address challenges that are transnational in nature, complex in structure, and emerge over a longer time horizon.

It is no surprise that governments and government analysts think in terms of short-term national interests. Think tank analysts are simply responding to organizational, client-driven, and personal incentives. Before we turn specifically to the role of think tanks in U.S.-China relations, it is worth highlighting some of the general structural shortcomings that limit the effectiveness of think tanks across a broad range of policy domains.

While many of those working inside of think tanks undoubtedly feel that their work plays an important and constructive role in the policymaking process, public opinion polls do not share this perspective.[21] Writing in *Foreign Policy*, Matthew Rojansky and Jeremy Shapiro put the matter bluntly: "if think tank experts have such great insight into policy, why are the outcomes so terrible so much of the time?"[22] After a string of major foreign policy blunders, the wars in Iraq and Afghanistan being notable examples,[23] it's not surprising that think tanks are no longer seen as progenitors of wise counsel.

It is not just the public that is frustrated with think tanks. Even those within government often privately admit that think tanks too infrequently produce output that is both compelling and relevant. As stated by former State Department officials Anne-Marie Slaughter and Ben Scott, the traditional American think tank model "is too elitist, too narrow, and too slow." The authors concluded, "the Progressive Era model of think tanks as extensions of technocrat-

21 Tom Hashemi and Aidan Muller, "Forging the think tank narrative US," *Cast from Clay*, March 21, 2018, https://castfromclay.co.uk/models-research/forging-the-think-tank-narrative-perceptions-usa/.

22 Matthew Rojansky and Jeremy Shapiro, "Why Everyone Hates Think Tanks," *Foreign Policy*, May 28, 2021, https://foreignpolicy.com/2021/05/28/why-everyone-hates-think-tanks/.

23 Many people would consider the last twenty years of U.S. policy towards China as falling into this category.

ic governance is no longer sufficient to make meaningful, large-scale progress in resolving public problems."[24]

Several shortcomings in the structure and incentives facing think tanks are readily apparent. First, those organizations best able to influence the policymaking process, owing to their robust network of connections to past, present, and future administrations, are often burdened by high operating costs, which necessitates a constant focus on fundraising. This is true for organizations as a whole and for the individual programs and researchers within them. Think tanks with robust endowments are increasingly rare, especially among nonpartisan and ideologically independent think tanks. Funding responsibilities are foisted upon the programs themselves in a relationship similar to that of tenants in a shopping mall: programs are generally welcome to stay if they cover their costs and contribute sufficient overhead to the parent organization. This constant drive for fundraising tends to redirect research priorities away from long-term, complex issues and towards more immediate, technical concerns (e.g., tax and regulatory policy). While such work can be effective, it crowds out focus on complex, long-term challenges. Researchers and analysts who are well positioned to think through the most pressing challenges instead spend copious amounts of time writing funding pitches and grant proposals, trying to intuit and respond to the priorities of funders.

Corporations and foreign governments are responsible for a significant amount of think tank funding. While governance policies at think tanks vary, with some instituting policies to guard against conflicts of interest, it is difficult for organizations that rely on this funding to avoid a gravitational pull towards those issues that are of most immediate concern to the funders. While it is often the case that research proposals pre-date the search for funding and many think tanks demand grant agreements that prohibit substantive funder input, this model of fundraising, in the aggregate, promotes a focus on a relatively narrow range of near-term interests.

Second, success at a think tank is usually measured first by fundraising, and second by "impact." How impact is measured can vary, but it generally refers to the ability to point to how government has adopted or incorporated a researcher's recommendations into policy or to media mentions. The

24 Anne-Marie Slaughter and Ben Scott, "Rethinking the Think Tank," *Washington Monthly*, November 8, 2015, https://washingtonmonthly.com/magazine/novdec-2015/rethinking-the-think-tank/.

former results in a focus on recommendations that address near-term policy challenges. The latter results in experts spending inordinate amounts of time doing interviews with journalists to get their (and their organization's) name in the news cycle. Rarely are these interviews sources of deep insight; rather they are a symbiotic relationship created from journalists' needs to incorporate quotations from experts, and from experts' needs to be mentioned (e.g., "Jane Doe, from Major Think Tank, says 'U.S.-China relations are unstable and the upcoming presidential meeting will be a chance to adjust the tenor of the relationship.'").

Third, think tanks serve an important function as holding pens for human talent. This provides members of a prior administration with the time and space to digest lessons learned and a platform from which to communicate this to a wider audience. It also allows experts to perform research that can directly inform the policies of a current or future administration. One of the problems with this role as talent incubator, however, is that think tanks are increasingly viewed as places to create a portfolio of work whose primary purpose is to get noticed for a future position in government. The incentive for many young researchers is thus to craft relatively innocuous proposals for the next administration or critiques of the existing one, rather than grapple with the truly difficult long-term issues. Productivity is measured in numbers of papers and media mentions, rather than substance.

Fourth, the quality of research across think tanks varies widely. While some have built a reputation for thoughtful and pragmatic research and analysis, others serve merely as veneers for ideological interests. As Eric Alterman of Brooklyn College argues, "The research these organizations produce tends to be footnoted, but the footnotes themselves are often questionable, and ideological counterarguments are rarely entertained except in mocking tones."[25] Think tanks with commitments to certain ideological worldviews or political parties often focus on "defeating" competing worldviews and political parties rather than focusing on policy outcomes that could have impact beyond established group demarcations.

And despite the proliferation of think tanks and other policy-advocacy groups, there is a strikingly narrow band of conventional wisdom that con-

25 Eric Alterman, "The Professors, The Press, The Think Tanks–and Their Problems," *Academe* (May-June 2011), https://www.aaup.org/article/professors-press-think-tanks%E2%80%94and-their-problems#.YW2lBp5KhOo.

strains original, or at least divergent, thinking. Part of this might be by necessity—to remain relevant to the actual, existing policy process and surrounding debates—but on a number of more complex and long-term issues, where heterodox ideas are precisely what is needed, policy think tanks generally fail to be creative, reverting instead to group-think, if they are even focusing on these issues at all.

The efforts of think tanks to propose effective solutions to U.S.-China tensions are subject to the above-mentioned general shortcomings, but also reflect particularities of the bilateral relationship and the dynamics that shape it.

The first and most pronounced limitation of current China-focused think tank work is its overwhelmingly nationalist orientation. The vast majority of research focuses on advising the U.S. and allied governments on how to more effectively "compete" with China on a wide range of issues, from technology to military to economics. This, in itself, is not a defect of think tanks *per se*, as most relevant American policy organizations are oriented specifically to advising the U.S. government on how it can succeed in a competition or conflict with China. Yet it should come as no surprise that if organizations are structured primarily to advance national agendas, they will come up short on solutions to global challenges that don't have a clear us-versus-them component.

For example, most American think tanks recognize that addressing climate change can and should be a shared endeavor of Beijing and Washington D.C., yet few organizations are advancing sustained efforts to forge enduring solutions that take into account both U.S. and Chinese interests. And on issues relating to technology, zero-sum thinking filtered through the lens of national security dominates the policy discussion. Again, this is not to deny that the American relationship with China often necessitates such an outlook, especially considering Beijing's efforts to invest in technologies that will have profound effects on individual privacy and the ability of the Chinese military and Communist Party to project power regionally and globally. But the overwhelming focus on the short-term issues relating to technology is crowding out research on how both the United States and China have near-existential stakes in forging solutions across a range of technology governance issues.

Other Organizations and Individuals

While the focus of this section is primarily on the role of think tanks, it is worth briefly addressing the limitations of other organizations, including academia, government, foundations, and independent policy experts, if only to accentuate the need for new organizational approaches.

Universities and other academic institutions are the repositories of massive amounts of relevant expertise. But despite the intellectual rigor of academic research, it is often too divorced from current policy context to be prescriptively useful. Academic institutions do not have policy advocacy as part of their organizational mission or DNA. In fact, in most of traditional academia, there is a cultural and institutional aversion to prescriptive policy work. This is not universally the case, however, as some universities recognize and value their contributions to the economic vitality of the region, nation, and world, and strive to contribute to solutions to global challenges. But this is not incentivized to nearly the same degree as other, more traditional academic endeavors, such as original scholarship and teaching.

Furthermore, the academic peer review process tends to discourage risk taking and encourage hyper-specialization, leaving academics less likely to address broader, multidisciplinary questions. There are some hybrid models hosted at universities, however, that seem to do a more effective job straddling the academic and policy worlds. Some relevant examples include Georgetown's Center for Security and Emerging Technology, Stanford's Center for Advanced Study in the Behavioral Sciences, Harvard's Tobin Project, and the University of Edinburgh's Edinburgh Futures Institute.[26] However, on close inspection, the research at centers like these is often led by policy-oriented or technically expert affiliated research fellows, who are able to conduct the more applied research that traditional faculty incentives lead their tenured or tenure-track colleagues to eschew.

In addition to think tanks and universities, governments are also home to a huge amount of expertise. Unfortunately, aside from a few small hubs of innovation like the Department of Defense's Office of Net Assessment, government bureaucracy often gets in the way of meaningful long-term strategic work. Bureaucratic structures are so rigid that the usual outcome of looking at

26 The host of this project, Johns Hopkins SAIS Foreign Policy Institute, also has a long history of this sort of policy research.

longer-term policy issues is establishing working groups, commissions, annual reports. What may have started with good intent simply turns into an annual reporting exercise, with each new report beginning the moment the current one is finished. Within government, some of the few places where innovation can sometimes be found are in corners of the intelligence community and special forces: these cultures are more likely to risk working outside existing structures and bureaucracies because effectiveness is more important to their missions than are processes.[27]

Independent China analysts are also failing to address the big, strategic questions, focusing instead on the daily policy vibrations. With this emphasis on near-term policy movements and events, these experts and pundits increasingly depend on third-party collectors of information, such as listservs and specialized newsletters. These tools essentially serve as news aggregators that answer the basic question "what happened in China today." Many expert consumers of this information simply repackage and relay this news to their respective companies and clients, positioning themselves as possessing the most current knowledge about that sector, rather than spending their time and expertise examining broader implications for big questions about the future.

This problem extends to many of the China specialists often quoted in the news media. The focus on getting one's name into the news cycle rewards those who race to be first with the news or provide some clever comment or snarky quip. Hits and attention are currency, so experts are motivated to comment quickly on anything and everything, often simply posting links to breaking news from major media outlets. The Twitter-ization of expertise has resulted in the conflation of information and insight.

Many grantmaking foundations have their own shortcomings in this regard. Funders tend to gravitate to topics that may seem strategic or forward-thinking, but which are often fairly obvious issues du jour. Addressing complex, long-term challenges requires funders who are not afraid to take chances. Too many funders choose the topics, ask the specific questions, and push for certain results. It is, of course, a funder's prerogative to direct their funds where they believe the funds will best serve the organization's ends. But

27 Dominic Cummings, "#29 On the referendum & #4c on Expertise: ON the ARPA/PARC 'Dream Machine', science funding, high performance, and the UK national strategy," *Dominic Cummings's Blog* (September 11, 2018): 18, https://dominiccummings.files.wordpress.com/2018/09/20180904-arpa-parc-paper1.pdf.

the most effective funders focus on investing in people, putting those people in a productive environment, and incentivizing them to figure out the problems and questions, as well as work towards solutions.

It should be noted that these shortcomings are not limited to organizations within the United States. These structural failings can be found across the world, exacerbated by the fact that each country, vis-à-vis China policy, is stuck in its own national silo: U.S.-China relations, Japan-China relations, Australia-China relations. Each country assesses the relationship primarily through a bilateral national lens, imposing a competitive framework on what is often subject to larger, complex, global dynamics. This "frog-in-a-well" syndrome limits both the questions that are asked and the solutions considered.

Lessons from Innovative Organizations

Given the structural inadequacies of the organizations discussed above, we cannot rely on these traditional entities to address certain critical, complex, long-term strategic questions. As we look to create new structures more amenable to this, there are a number of historical organizations that were successful at achieving breakthrough innovations in other areas that can provide valuable lessons about effective organizational incentives and structures. Bell Labs, the Advanced Research Projects Agency (ARPA), Xerox Palo Alto Research Center (Xerox PARC), and the RAND Corporation[28] all offer verdant ground for lessons learned about stimulating innovation in the face of complex, long-term challenges.

Each of these organizations was created to address an unmet need and grew to foster truly innovative thinking. Bell Labs was founded in 1925 by Western Electric and AT&T to focus on basic and applied research that would inform the future of the telecommunications industry. Jonathan Gertner, author of *The Idea Factory*, stated the case succinctly: "For a long stretch of the twentieth century, Bell Labs was the most innovative scientific organization in the world."[29] One of the things that set Bell Labs' approach apart was that they didn't focus on simply thinking up good ideas; they recognized that an important part of connecting innovation with the market was to start by looking for good problems.[30]

ARPA was created in 1957 by President Eisenhower, originally to centralize all space-related research so that it would report to the secretary of defense. Bureaucratic turf battles with NASA and branches of the military resulted in ARPA temporarily becoming a fringe agency that was only able to pursue "beyond-the-cutting-edge" projects that the service branches could do

28 The RAND Corporation is still a powerhouse in policy research, but the focus here is on its early days, thus its inclusion in the "historical" case studies.

29 Jonathan Gertner, *The Idea Factory* (London: Penguin Books, 2012), 1-2.

30 Gertner, 33.

without.[31] Jack Ruina, the first head of ARPA, hired one of the true geniuses of the twentieth century, J.C.R. Licklider ("Lick"), to turn the agency into "a force for technological excellence."[32] Lick was told to "assault the technological frontiers everywhere you can."[33] The end-result, among others, was the interactive computer and networked systems we depend on today, as well as the seeding of innovative excellence across the country.

Xerox PARC's origins go back to Xerox's strategically questionable purchase of Scientific Data Systems (SDS) in 1969. The initial mission of the new acquisition was to expand Xerox's rule over "the office of the future."[34] Jacob Goldman, the newly arrived chief scientist who did not approve of the deal, decided to turn SDS instead into a world-class research unit. He and George Pake built one of the finest teams ever assembled to assault the frontiers of technology. Perhaps their greatest strategic insight was not to anticipate the future and help Xerox navigate it, but to articulate a vision for the future and then work to create that future on behalf of Xerox.

Finally, the RAND Corporation was born from Project RAND, a post-World War II effort to retain the connections between scientific and technological talent mobilized during the war with the military. Initially housed via contract at the Douglas Aircraft Corporation, RAND was spun off into an independent nonprofit corporation in 1948, with initial funding secured via an interest-free loan and loan guarantee from the Ford Foundation. RAND's mission was to improve public policy by helping the government, military, and other clients get unbiased, evidence-based information about complex problems facing the nation, and ultimately, in their words, to make the world better.[35]

While these organizations had their differences in focus and structure, five important common success factors emerge from our analysis. Each of these organizations:

1. Aligned their mission with a big vision that touches on deep questions about humanity

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31 M. Mitchell Waldrop, *The Dream Machine (*San Francisco: Stripe Press, 2018), 199.
32 Waldrop, *Dream Machine*, 199.
33 Waldrop, *Dream Machine*, 200.
34 Michael A. Hiltzik, *Dealers of Lightning* (New York: Harper Collins Publishers, 2000), 29.
35 *Ideas in Action: 60 Years of Rand*, DVD, directed by David Mallet (Santa Monica: RAND, 2005).

2. Focused on a long time horizon
3. Created a community of top talent
4. Allowed time, space, and autonomy for exploration and problem finding
5. Secured patient, long-term funding

Aligning With a Big Vision

Bell Labs, ARPA, and Xerox PARC all began with a big vision that would, as computer scientist Alan Kay said, act "like a magnetic field from the future that aligns all the little iron particle artists to point to "North" without having to see it."[36] The vision captured people's imagination and allowed them to explore aspects of it that they found personally interesting and worth pursuing.

A number of researchers who played key roles in ARPA's organizational development were inspired by their time at the MIT Research Laboratory for Electronics (formerly the Rad Lab), which, according to electrical engineer and future MIT president Jerry Wiesner, took as its charter "'the universal role of communication processes in man's universe.... Our interests ranged from man-made communications and computing systems to the sciences of man, to inquiries into the structure and development of his unique nervous system, the phenomena of his inner life, and finally his behavior and relation to other men.'"[37]

Leadership at Bell Labs determined that goals should have an "indistinctness," but serve a clear larger vision: "anything remotely connected to human communications."[38] Within that vision, engineers and scientists could pursue any problems they wished. According to Gertner, "the techniques forged at Bell Labs—that knack for apprehending a vexing problem, gathering ideas that might lead to a solution, and then pushing toward the development of a product that could be deployed on a massive scale—are still worth consid-

36 Alan Kay, "The Power of the Context," transcript of speech delivered upon being awarded—with Bob Taylor, Butler Lampson and Chuck Thacker—the Charles Stark Draper Prize of the National Academy of Engineering February 24, 2004, last accessed 9/2/21 at https://www.debugmind.com/files/alan-kay-context.pdf.

37 Waldrop, *Dream Machine*, 91.

38 Gertner, *Idea Factory*, 32.

ering today, where we confront a host of challenges (information overloads, infectious disease, and climate change, among others) that seem very nearly intractable." [39]

RAND's overarching vision is perhaps less dramatic; it is focused more on their belief that rigorous, evidence-based analysis can and should inform policymaking. But for them, that umbrella still provides cover for a wide array of innovative approaches to problems. The RAND Corporation is well-known for their expression "the answer is a question," stressing the need to get to the fundamental, underlying issues that need resolution.[40]

This problem-centered approach is an important corollary to aligning with a big vision. Innovation should be in service to a human problem, not simply innovation for innovation's sake. Gertner observed that at Bell Labs "… there were plenty of good ideas out there, almost too many. Mainly they were looking for good problems."[41] Even though Bell Labs, Xerox PARC, and ARPA were focused on technology, they retained a strong connection to the human element of their innovations.

Aligning with a big vision also helps keep focus on the horizon, avoiding the distractions and frameworks of the present. Excessive attachment to current paradigms is a dangerous element of human nature. John Pierce of Bell Labs believed that, "Humans all suffered from a terrible habit of shoving new ideas into old paradigms. 'Everyone faces the future with their eyes firmly on the past'…"[42]

Long Time Horizon

One of the themes that comes up repeatedly, especially in the cases of Bell Labs, ARPA, and Xerox PARC, is the need for long time horizons. Arthur Waldrop credits much of the success at ARPA to the leadership, who not only understood the overarching vision, but "perhaps most important, they continued to foster ARPA's extraordinary un-federal-government-like management style—one that might be summarized as allowing 'the freedom

39 Gertner, 4.
40 *60 Years of Rand*, DVD.
41 Gertner, 33.
42 Gertner, 200.

to make mistakes."[43] In his analysis of Licklider's success at ARPA, Waldrop notes "Perhaps most important of all, however, Lick had the patience to take the long view. He couldn't get it all done in one year, or two years, or a lifetime. But by creating a community of fellow believers, he guaranteed that his vision would live on after him."[44]

At ARPA, Bob Taylor encouraged people to get ten years ahead of the curve. Waldrop paraphrased Taylor's approach as "Don't just invent the future; go *live* in it."[45] This was similar to the approach at Xerox PARC, where Alan Kay was frustrated by Xerox's attitude of scanning the future for trends and then defending against them. Kay's response to this was "Look, the best way to predict the future is to *invent* it!"[46] At Xerox PARC, Jack Goldman's assistant George White emphasized the importance of getting far ahead: "Otherwise, by the time the ripening and maturing process from your research comes through events will have overtaken you."[47] As a telling counter-example, Bell Labs started to decline and ultimately fail when they were forced to focus less on fundamental research and more on commercial return and shorter time horizons.[48]

People and Community

The third important factor, while working in the pursuit of a grand vision over a long time horizon, is to create an interdisciplinary community of smart, creative people. All of the organizations we analyzed had this in common: they recruited and attracted the best and brightest. A number of the other factors we describe contribute to their ability to do so, but the fact remains that the key asset is the people, not the ideas or products.

At ARPA, Jack Ruina told managers to find the best and brightest. Waldrop paraphrases Ruina as telling them to "Go out to the university labs, the national labs, the private sector, anywhere. Look for people with ideas that push the envelope. Give them development money. Be generous. Take risks.

43 Waldrop, 318.
44 Waldrop, 252.
45 Waldrop, 339.
46 Hiltzik, *Dealers of Lightning,* 122.
47 Hiltzik, 124.
48 Gertner, 346.

Cut through the red tape. Do whatever you have to do. But do it."[49] Beyond attracting smart individuals, the key was to form them into a community. Licklider didn't care much for people's accomplishments and laurels; he focused on just getting very bright people.[50] For Lick, the point was to have fun. There was no tolerance for laziness or unclear thinking, but Lick didn't tell them what to do.[51] It was an atmosphere of ideas and excitement. Brainstorming in a group over "beer and pretzels" was better than sitting alone and writing a chapter.[52] The community and atmosphere were warm and interactive. This was key not only at ARPA, but also at Bell Labs. Bell Labs set out to create "an organization of intelligent men," recognizing that an interdisciplinary group was better than the lone scientist or small team.[53]

The interdisciplinary aspect of the community is also a critical insight. A critical mass of exceptionally bright people is important, but it was equally important that they have people of a similar caliber from other backgrounds in order to foster creativity and new insights. At Bell Labs, Kelly believed that "the most valuable ideas arose when the large group of physicists bumped against other departments and disciplines…"[54] Xerox PARC had an open-door policy which led to lots of cross-pollination with Stanford researchers, professors, and students.

RAND also succeeded in building a strong sense of community. They attribute part of this to their policy of open office doors and freeform atmosphere, recognizing that many of the best ideas, interactions, and cross-pollination of ideas happened while having lunch in the courtyard and other non-traditional environments. They claim they didn't need to tell people how long to work; people worked because they wanted to work on those sticky questions. They had a sense of mission. People don't just work there, "they belong there."[55] They were able to attract some of the best and brightest because they offered funding and intellectual freedom. They fostered an exciting

49 Waldrop, 200.
50 Waldrop, 115.
51 Waldrop, 119.
52 Waldrop, 120.
53 Gertner, 32-33.
54 Gertner, 345.
55 *60 Years of Rand*.

and collegial atmosphere where their people could work on important and difficult questions.[56]

One of the most important insights about creating a research community, was that it is not just about the policies and atmosphere, but about the central disciplinary focus that serves as its formative glue. Waldrop quotes James Morris of Carnegie Mellon as saying, "Remember, in the aftermath of *Sputnik*, the glamour field was physics, not computing. Lots of very smart people made a career decision to go into a field that didn't exist yet, simply because ARPA was pouring money into it." Licklider himself explicitly recognized that by creating a community and providing ample funding, *the community emerged into a field.*[57] As we look to new areas worthy of deep, interdisciplinary investigation, this is a critical factor to keep in mind.

Time, Space, and Autonomy for Exploration and Problem Finding

As they attracted the best and brightest, all of these organizations provided their talent with the time and space to explore whatever ideas the researchers thought worth pursuing, even if it led them down long alleys and dead ends. At Bell Labs, researchers were given what researcher Morry Tanenbaum called "circumscribed freedom."[58] At Western Electric, the Bell Labs predecessor, they strove to create "a free environment for the 'operation of genius'… genius was not predictable. You had to give it room to assert itself."[59] At Bell Labs, Pierce "was given free rein to pursue any ideas he might have."[60] Often this meant paying people to articulate and understand problems. The most entrenched and complicated problems are often not what they appear on the surface; they require intellectual noodling and exploration. Lick himself recognized that the majority of his time was spent not on what most outside observers would consider his main accomplishments, but on getting into the position to think, exploring hypotheses, learning new things necessitated by a problem, and other activities required to "get into a position" to do the "real

56 *60 Years of Rand*.
57 Author emphasis. Waldrop, 252-253.
58 Gertner, 352.
59 Gertner, 27.
60 Gertner, 194.

work."[61] At Bell Labs the line between the art and science of discovery was not always clear, leading researchers to prefer thinking of their work not as lab work, but rather as work at "an institute of creative technology."[62]

A major aspect of providing this space for the "operation of genius" was the removal of distractions. The researchers' job was to work on the primary issues at hand, not be drawn away by administrative burdens. For university researchers and professors who made the jump to these organizations, this meant not having to deal with the burdens of tenure, teaching, grading papers, dealing with university bureaucracy, and, most importantly, raising funds.

Patient, Long-Term Funding

The final and indispensable success factor across all of these organizations was the availability of ample, long-term funding. Without large amounts of money, none of these organizations would have existed. A huge proportion of researchers' time is spent seeking, applying for, and shaping research around funding. This not only takes them away from their primary task but also forces them to only pursue those mainstream topics which are most likely to get funding. This is akin to the old adage about the man looking for his lost key under a streetlamp. When asked by a bystander where he lost it, he replied that he lost it down the street, but that the light is better here.

Fernando Corbato, as quoted by Waldrop, captures this dynamic at ARPA well:

> "this was at a time when the National Science Foundation was handing out money with eye droppers—and then only after excruciating peer review. Compared to that, Lick had a *lot* of money. Furthermore, he was giving out umbrella grants, which allowed us to fund the whole program. So there was this tremendous pump priming, which freed us from having to think small. The contrast was so dramatic that most places gravitated to ARPA. So that opening allowed a huge amount of research to get done."[63]

61 Waldrop, 155.
62 Gertner, 3.
63 Waldrop, 445.

Without this funding to support Lick's vision, Waldrop points out that there "would have been no ARPA community, no Arpanet, no TCP/IP, and no Internet. There would have been no Project MAC-style experiments in time-sharing, and no computer-utilities boom to inflame the imagination of hobbyists with wild speculations about 'home information centers.' There would have been no life-giving river of cash flowing into DEC from the PDP-10 time-sharing machines it sold to the ARPA community. There would have been no windows-icons-mouse interface a la Doug Engelbart. And there would have been no creative explosion at Xerox PARC."[64]

Discussing the importance of funding at Bell Labs, Gertner stresses, "An institute of creative technology required a stable stream of dollars. 'Never underestimate the importance of money,' the physicist Phil Anderson says—and it was true."[65] It was this steady funding that allowed them to look ten or twenty years down the road. It allowed Xerox PARC to pay a premium pay scale so they wouldn't be outbid by universities and other organizations.

Exploring the lessons of Xerox PARC's successes (and failures), Hiltzik notes that one of the reasons we don't have a new Xerox PARC today is that the environment for corporations has changed. "No company, no matter how wealthy, dares devote even a fraction of its wealth to search for knowledge that may not produce a return to the bottom line. The utopian ideal of a corporate laboratory whose scientists are free to roam through Ideaspace draws only ridicule today."[66]

Concluding Thoughts

In 1997, at the age of eighty-six, John Pierce started to explore what lessons could be learned from Bell Labs. He thought the primary factors of success could be reduced to four factors:

- A technically competent management all the way to the top.
- Researchers that didn't have to raise funds.

64 Waldrop, 445.
65 Gertner, 154.
66 Hiltzik, 397.

- Research on a topic or system could be and was supported for years.
- Research could be terminated without damning the researcher.[67]

Jacob Goldman's philosophy at Xerox PARC, as described in *The Dream Machine*, also included many of these factors:

> "It wasn't enough to just hire a bunch of supersmart individuals. You had to build a community, a culture, an environment of innovation. You had to give your people the kind of challenge that would light a fire in their eyes, that would generate an atmosphere of nonstop intellectual excitement, that would let them feel in their gut that *this* is where the action is. You had to provide them with lavish resources—everything they needed to do the job, without stinting. And through it all, most important, you had to keep the bottom-line guys at bay so *your* guys could have the freedom to explore and make mistakes. Somehow you had to make the higher-ups accept that none of this would necessarily result in products the following year, or maybe even in five years. But in ten years you might just change the world."[68]

These organizations are obviously not the only ones with important lessons for organizational innovation. These were selected partly due to their legendary status as incubators of groundbreaking research and applied knowledge, partly to the fact that, with the exception of RAND, all are from outside the policy realm, and also because they were able to institutionalize these practices, as opposed to conducting one-off research projects. There were also notable post-war attempts to address complex policy challenges through ad hoc working groups. Two notable and relevant examples are the aforementioned Ford Foundation Gaither Commission Report and the Rockefeller Brothers Fund (RBF) Special Studies Project (SSP). While the Gaither Commission focused on defining a vision specifically for the Ford Foundation, RBF's Special Studies Project aimed at providing a strategic assessment and vision for the entire nation.

There are parallels between the time in which the SSP was formed and today. 1956 was a time of geopolitical uncertainty, with Laurance Rockefeller, writing on behalf of the RBF trustees, stating that "The age in which we live

67 Gertner, 351. Quoting a letter from John Pierce.
68 Waldrop, 323.

is one of deep and widespread ferment. We have been witnessing a revolution in politics, social order, science, economics, diplomacy, and weapons."[69] The report claims that the United States was "in a critical situation requiring the urgent attention of thoughtful citizens."[70] The project formed a high-level working group composed of former government officials and esteemed corporate, academic, and civil society leaders and then further organized subpanels involving 108 individuals. The final report was nearly 500 pages, including six primary reports.

While the overall report provided an extraordinary, detailed strategic overview of the challenges facing America, in terms of providing innovative, out-of-the-box thinking, the report was less successful. Professor John Andrew III, writing in the Presidential Studies Quarterly, noted that in initial "ideal world" submissions from experts, "The distinguished authors, ironically, could discuss programs but seemed to have difficulty conceptualizing policies and envisioning a future much different from the past or present. The new agenda seemed to be chiefly an effort to make small adjustments in existing policies."[71] Andrew continues, "most of the panelists operated within very narrow intellectual boundaries. Few questioned fundamentals. They pursued reform, not structural change. They professed to seek a wider vision, but most often fell short."[72] While the project was clearly successful at convening recognized leaders and experts, it was less successful at coming up with truly innovative solutions to the actual policy challenges.

Both the SSP and Gaither Commission were established for a discrete purpose, and then disbanded after the reports were issued. These provide helpful examples of the importance of gathering a leading group of high-level citizens that provide convening power and have direct connections to policymakers, but also may demonstrate negative lessons about the ability to make substantive progress on the challenges themselves. The absence of a long time horizon and pressure to provide near-term results and recommendations are likely major contributors to these shortcomings.

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69 *Prospect for America: The Rockefeller Panel Reports* (New York: Doubleday, 1961), xv.

70 *Prospect for America,* xv.

71 Andrew, John, III, "Cracks in the Consensus: The Rockefeller Brothers Fund Special Studies Project and Eisenhower's America," Presidential Studies Quarterly, Summer 1998, Vol. 28, No. 3, 536.

72 Andrew, 537.

Recent Attempts at Organizational Innovation

In addition to the organizations above, there are lessons to be learned from organizations that have more recently adopted alternative approaches, including the Janelia Research Campus, the Santa Fe Institute, the MacArthur Foundation's Research Networks, Stanford's Center for Advanced Study in the Behavioral Sciences, and the Tobin Project. Following is a brief description of each, and then we will return to them later in discussions of new organizational models.

In terms of intentional organizational design, Janelia (originally the Janelia Farm Research Campus, or "Janelia Farm" for short) may be the most outstanding recent example of how applying innovative organizational best practices to complex problems can stimulate the creation of new knowledge and tools.

Originally conceived in 1999, Janelia was established by the Howard Hughes Medical Institute (HHMI) in 2006 in a concerted effort to break through academic impediments in the pursuit of biomedical breakthroughs necessary for pushing the frontiers of knowledge. To this end, HHMI funded the construction of a $500 million purpose-built campus for the Janelia Farm Research Campus on 281 acres in Ashburn, Virginia and committed to covering the annual operating budget, freeing researchers to focus on research. It is worth noting that even as construction began, people still didn't know exactly what the specific research focus would be. Instead, the emphasis was first on building a collaborative scientific culture, attracting top talent, and creating a financially and intellectually independent institution. The priority was more on the "how" than the "what."[73]

Gerald Rubin, one of Janelia's founders and its first director, took lessons from some of the organizational sources of past innovation, including Bell Labs and the Cambridge-based Medical Research Council Laboratory of Molecular Biology. He carefully and deliberately structured Janelia in accordance with the some of the best practices of these and similar organizations: attracting the best and brightest, forming them into small, collaborative teams of multidisciplinary groups, providing ample long-term funding, allowing long research time horizons, granting research freedom and permission to

73 Howard Hughes Medical Institute. "Janelia Farm Research Campus: Report on Program Development," November 2003, 36.

flirt with failure, and encouraging exploration of the unknown. Researchers at Janelia have no grants to seek, no papers to grade, no classes to teach, no committees on which to serve. The simple, powerful idea behind Janelia is to remove the barriers to long-term problem solving, "liberating smart people to do meaningful work."[74]

Janelia sees itself not as a rebuke to other research organizations, such as universities or private companies, but as a complementary, alternative model to serve different needs and ends—both human and research. And while Janelia works on fundamental research and long time horizons, it also aims to strike a balance between long-term research freedom and application of the newly acquired knowledge and building of tools.

The Santa Fe Institute (SFI) is another cross-disciplinary research center that was established in an effort to break out of stove-piped, linear thinking. The original impetus was to push back against the division of researchers into what founder George Cowan called "specialized camps that more or less ignored one another"[75] and what C.P. Snow referred to as the two cultures.[76] They also recognized that universities had limitations, and "were ill-equipped to nurture emerging new fields."[77] Cowan's idea was to "attack problems that cut across many fields, problems like human behavior and cognition."[78] It took a number of years to go from concept to reality, but Cowan and his colleagues eventually got things moving by hosting a series of workshops, inviting a cross-disciplinary group of researchers together to discuss topics of interest and the concept of a new institution. One of the reasons this approach was so successful was that Cowan was able to bring together a core group of highly esteemed scientists, including a large number of Nobel laureates.

Currently, SFI's focus is on complex systems science. It is both an institution and a network. SFI calls itself a "visiting institution," hosting meetings, workshops, conferences, and resident researchers and post-docs. They host around 25 resident researchers and have a network of around 120 external

74 Author interview with Gerald Rubin, April 4, 2021.

75 This section draws heavily on two articles on the history of the Santa Fe Institute posted on the SFI website: https://www.santafe.edu/about/history.

76 C.P. Snow, *The Two Cultures and the Scientific Revolution* (New York: Cambridge University Press), 1959.

77 "History," Santa Fe Institute.

78 "History."

professors and scientists. Those whom SFI refer to as "fractal faculty" spend up to three months per year in residence. SFI espouses all of the same principles that were present in the organizations discussed above. They start with finding exceptionally bright people and invite them to join. These researchers are firewalled off from fundraising. Rather than telling researchers what to study, they "cultivate a great community and let the researchers propose what they should study."[79] They offer a mix of space for contemplative research and for group workshops where, in the words of SFI vice-president for applied complexity William Tracy, "high burst" intellectual work can happen.[80]

One of the most important insights that SFI recognized is that to attract talent they needed to align the work of the organization with that of the researchers. In practical terms, this means that the innovative work that either happens at SFI or is inspired by SFI workshops leads to publications in top journals. Publications are the incentives of the home institutions, the "currency of the realm," both for junior researchers who are in early stages of their career, and for more seasoned tenured faculty. The professional connections made at SFI also have direct, positive impacts on the researchers' "day jobs." SFI also has been able to create a strong sense of community and distinctive culture. For a sense of the organizational culture, it is worth reading SFI's operating principles on their website, written by author and trustee Cormac McCarthy.[81]

Stanford University hosts the Center for Advanced Study in the Behavioral Sciences (CASBS), an organization that grew directly out of the Ford Foundation Gaither Commission Report's "Program Area Five: Individual Behavior and Human Relations." The goal of this program area was to apply new methods of scientific knowledge to questions of human welfare by examining "the principles which govern human behavior in political, economic, and other group activities, and in the individuals' personal life."[82] The Committee declared that "the first essential step in the further understanding of human behavior is to institute a long-range plan for the increase in basic knowledge."[83] In 1952, the Ford Foundation trustees approved the creation

79 Author interview with William Tracy, March 3, 2022.
80 Ibid.
81 "Operating Principles," *Santa Fe Institute*, updated 2017, https://www.santafe.edu/about/operating-principles.
82 Gaither et al., *Study for the Ford Foundation on Policy and Programs*, 91.
83 Gaither et al., 97.

of such a center, the Center for Advanced Study in the Behavioral Sciences, which was officially established at Stanford University in 1954. It was first structured as a way for senior scholars to train younger ones, with the hopes of enlarging the social science talent base. But the forced seminar style, where senior fellows lectured to junior fellows, was found inconducive to substantive intellectual exchange, and the Center moved to a more informal model.[84] The CASBS website currently describes their organization as follows: "A leading incubator of human-centered knowledge, CASBS facilitates collaborations across academia, policy, industry, civil society, and government to collectively design a better future."[85] CASBS's activities range from two-week training programs, year-long fellowships and projects, to multi-year programs.

The MacArthur Foundation's Research Networks take a different approach. Rather than build a permanent organization, MacArthur funds ten-year project networks composed of interdisciplinary experts. MacArthur describes the networks as follows:

> They are designed to identify a big problem and bring together researchers, practitioners, and policymakers from multiple disciplines to work collaboratively over an extended period of time, typically six to as many as ten years. Ambitious and innovative—but not prescriptive—research networks liberate their members to pursue work that has the potential to change prevailing paradigms.
>
> We do not know from the beginning what the results of a research network will be; however, our experience suggests that providing the space and resources for motivated, dynamic thinkers to come together to solve complex challenges can be often fruitful.[86]

The use of networks, as opposed to the creation of a permanent organization, reflects what Valerie Chang, MacArthur's managing director of programs, described as a mechanism that can jostle researchers out of their day-to-day routines and get them to interact with a diverse group of people on

84 "The early years and mission," *Center for the Advanced Study in the Behavioral Sciences at Stanford University*, updated 2013, https://web.archive.org/web/20140811010850/http://www.casbs.org/early-years-and-mission

85 "About CASBS," *Center for the Advanced Study in the Behavioral Sciences at Stanford University*, https://casbs.stanford.edu/about/about-us.

86 "About Our Research Networks," *MacArthur Foundation*, updated April 2017, https://www.macfound.org/networks/.

topics of importance.[87] Originally more research-focused, these networks now increasingly emphasize policy relevance and impact. A significant amount of funding and effort goes into the planning for each network, getting a sense of how researchers work and honing the key questions, such as what paradigm shift is desired and what might be the shared network vision. Many of the principles and rationale for this network approach are described in a monograph by former MacArthur staff member and network participant Robert Rose, *Finding Answers To Big Questions: Overcoming Disciplinary Boundaries Through Research Networks*.[88]

The Tobin Project is another network-style organization that aims to bring scholarly expertise to current policy challenges. Founded in 2005 by David Moss, the Tobin Project is "motivated by the belief that rigorous scholarship on major, real-world problems can make a profound difference."[89] The project origins were conversations between David Moss and Nobel laureate James Tobin, where they recognized that there was a need to apply expertise from the academy to social and political problems. At the same time, being academics themselves, they recognized the limitations of university incentives to engage on these applied and prescriptive policy endeavors. The Tobin Project was founded to provide a forum and entrepreneurial spark for such work.

Their methodology is based on workshops and conferences, resulting in publications. They continue to refine a model for bringing scholarly expertise to policy challenges, which they describe as follows:

- Define strategic research questions with the greatest potential to benefit society.
- Engage leading scholars across disciplines and institutions, and build communities of scholars around core research questions.
- Incubate and produce new research through scholarly collaboration and with policymaker input.
- Disseminate compelling ideas through academia, public discourse, and policy formation.

87 Interview with Valerie Chang, April 20, 2021.

88 Robert M. Rose, *Finding Answers To Big Questions: Overcoming Disciplinary Boundaries Through Research Networks: A Guide to Conceiving, Organizing, Implementing, and Monitoring Interdisciplinary Research Networks,* https://www.macfound.org/media/files/rosenetworkmonograph.pdf.

89 "About," *The Tobin Project*, http://tobinproject.org/about.

- Innovate continually on the Tobin model of strategic research development. [90]

They currently focus on four pillars of research: government and markets, economic inequality, institutions of democracy, and national security.

According to founder David Moss,[91] while convening smart people is critical, success also requires discipline to drive conversations in the direction of new, novel topics. Otherwise, experts tend to expound on more conventional matters. Without guidance, policy discussions can also easily veer into unproductive political discissions. It is also important to ask the "right questions" at the outset, otherwise gravitational pull can lead in directions that aren't necessarily as interesting. Moss also recognized that finding the right people to frame and ask the questions is important; these people are not always subject matter experts, but they have the ability to see the big picture. Moss also echoed the observation made by the other organizations that it is important to separate people from the administrative and bureaucratic activities they dislike. Deep work happens when bureaucratic interference is removed.

90 "Tobin Project Model," *The Tobin Project*, http://tobinproject.org/tobin-project-model.
91 The following observations are from an interview with David Moss conducted by Jude Blanchette on June 10, 2021.

A New Model

The United States and China need to find a path out of their increasingly precarious security dilemma, and they need to do so in the geopolitical context of a global order under strain and on the precipice of enormous technological change. The aim of this paper is not simply to bring attention to this; progress requires new organizational mechanisms that encourage long-term thinking, avoid narrow, siloed approaches, and enable creative thinking beyond existing paradigms.

The previous section identified five factors essential for building an organization that stimulates innovative thinking. Four of these relate to organizational structures and incentives: a long time-horizon, a community of top talent, time and space for problem-finding and the "free operation of genius", and patient, long-term funding. But it is important to remember that the purpose of these structural qualities is to serve an organizational vision. "Aligning the organization's mission with a big vision that touches on deep questions about humanity" and "keeps researchers' eyes on the horizon" requires careful consideration of what is most important—of what should be the substantive focus of the organization. For this reason, I will turn next to one possible proposed vision and initial research agenda for the organization before returning to the structural aspects.

This paper has focused on long-term futures between the United States and China, and the role that technology will continue to play in exacerbating U.S.-China strategic competition, as well as the unintended societal consequences with which all countries and societies need to grapple. But there are other acute, entrenched transnational challenges, such as climate change, social justice, migration, and public health that would also benefit from new, innovative approaches. New approaches should be about more than just organizational structures; it is critical to pose the right questions. A well-articulated organizational focus should shine a light on the underlying assumptions and questions that underpin all of these challenges. That is to say, what are the basic questions that need to be answered to make progress on all of these issues?

Cutting across and underpinning all of these complex challenges are fundamental questions about social relations and human dignity. Without a shared understanding of, and basic agreement upon, what is valued at the core of our shared humanity, progress on transnational challenges is nearly impossible. This extends to relations between nations: what should we expect of other nations and they of us? In terms of the future of the global order, a vision and set of principles that are sufficiently resilient in the face of technological change, climate change, social justice, migration, and public health must be based upon some shared assumptions about what it means to be human in society.

Despite the myriad challenges described in its assessment of the complex mid-century strategic landscape and future of the United States, the 1961 Rockefeller Special Studies Report stated unequivocally: "No challenge is more important than to give concrete meaning to the idea of human dignity."[92] Sixty years later, this challenge is still unmet.

For these reasons, while there are many possible starting points for such a new organization, a first research pillar focused on human dignity, examined initially through the lens of the impacts of technology, would make valuable contributions which could then further inform and provide useful traction on a wider range of strategic issues.

While I propose that dignity be a first research pillar, looking beyond this to the organization's overall approach and methodology, the broader focus could be on c*ommon challenges that also offer applied opportunities to forestall conflict*. Such a mission recognizes that many entrenched, complex, transnational challenges also offer an important opportunity for cooperation, where grappling with the challenges has the additional benefit of bringing entrenched parties together. In this first case, using the lens of technology to bring human dignity into sharper focus can, if designed carefully to limit political interference, also provide the United States and China, among others, with a useful toehold for cooperation.

92 *Prospect for America*, 341.

Dignity: A Rationale and Research Agenda

Will not the knowledge of it, then, have a great influence on life?
Shall we not, like archers who have a mark to aim at, be more likely to hit upon what is right? [93]

-Aristotle, Ethica Nicomachea

One of the most worrisome and entrenched sources of geopolitical conflict stems from how emerging technologies are exacerbating geostrategic competition, particularly between the United States and China, with nations seeking control over the commanding technological heights in order to harness economic and national security gains for their exclusive advantage (see earlier section). Beyond geopolitics, the impacts of emerging technologies are stressing virtually every aspect of society, from relations between individuals, families, communities, nations, to the entire global order. Societal disruptions from new and emerging technologies are being felt across all cultures and demographics, and large portions of humanity are subjected to the societal consequences of innovations created elsewhere in the world. This technological disruption is forcing us to re-examine fundamental assumptions about the nature and value of labor, the equitable distribution of goods and services, and what it means to flourish as a human being.

Despite the fact that technologies are not confined to national borders or ideologies, nor are their impacts limited to economic and national security realms, current approaches to addressing technological disruption are still very much bound within the narrow confines of national policy and geopolitics. It does not appear that any single country's political and legal systems provide significant advantage in addressing these challenges, yet technology governance is still approached primarily as a nation-based political problem, with legal and ethical bases in national laws, constitutions, and bills of rights.

The unanticipated consequences of technological change make governance a more nuanced and complex challenge than those for which political processes might be more appropriate. Near-term national interests conflict with the long view of what is good for global society, and political representa-

93 Aristotle and Richard McKeon, "*Nichomachean Ethics*," in *Introduction to Aristotle* (New York: Modern Library, 1947).

tives are ill-suited to consider questions of broader humanity, as each has incentives to negotiate from the stance of their respective national economic and security interests. The language and mechanisms used for these discussions are also unavoidably stuck in the existing political order, and simple appeals to "democratic values" fall far short of the needs of citizens.[94] Put simply, forms of government as primary carriers of common values are insufficient in the face of the global, societal challenges from emerging technologies.

Liberal faith in Western legal systems to provide answers to these sticky moral and ethical questions is also misplaced. The American system of government was designed not to provide a moral framework, but to support a federal system by placing limits on national power. As Harvard University's Learned Hand Professor of Law Mary Ann Glendon explains:

> "The American framers' concept of the human person, though incomplete from a philosophical or anthropological point of view, was not inappropriate for the limited purpose of designing a federal framework within which civic life could flourish under conditions of ordered liberty. What needs to be kept in sight (but unfortunately is too often forgotten) is that the liberal principles enshrined in the United States' founding documents were political principles that were never meant to serve as moral guides for all of social and private life."[95]

At the center of the American political ethos is a hypothetical "self-sufficient person" who wants to protect his/her individual interests and property. But what happens when that self-sufficient person can no longer discern his/her interests or property? When interests and property are less tangible than the ownership or exchange of an ox, a plow, a purse of gold, what then? When we don't fully understand our own interests or even property, does the Bill of Rights or Constitution give useful guidance?

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94 In a May 26, 2021 memo to the leaders at the U.S. Department of Defense, Deputy Secretary Kathleen Hicks mentions the need to embed American values within AI development and deployment, but does not specify what those values are. Led by the Department of Defense, these are bound to be a mix of "democratic values" and pragmatic, America-centric, security considerations. See https://media.defense.gov/2021/May/27/2002730593/-1/-1/0/IMPLEMENTING-RESPONSIBLE-ARTIFICIAL-INTELLIGENCE-IN-THE-DEPARTMENT-OF-DEFENSE.PDF.

95 Mary Ann Glendon, "Looking for 'Persons' in the Law," *First Things*, December 2006, https://www.firstthings.com/article/2006/12/looking-forpersonsin-the-law.

Yet we lack a clear alternative. As the Israeli historian and philosopher Yuval Harari has stated, "Liberalism has no obvious answers to the biggest problems we face: ecological collapse and technological disruption."[96] If we are to rise to these challenges, we need a more universal foundation from which norms and global governance mechanisms can be built. We need, in the words of Pope John Paul II, "to look more deeply at man."[97]

Rather than view the challenges raised by emerging technologies solely as sources of geopolitical competition and friction, these challenges present a valuable opportunity to collectively grapple with the societal impacts of technology and inform a more just and inclusive global order: *technology ethics and norms may serve as one of the most promising areas for transnational cooperation, and further serve as a focusing mechanism through which we can re-examine some basic assumptions about what we have in common, beyond national boundaries and across ideologies, including basic questions about what it means to flourish as human beings.* This exploration would likely have positive spillover effects in other areas where our "social solidarity as a species"[98] is needed.

Exerting control over technology, in both its positive and negative societal impacts, requires a deeper understanding and articulation of what it means to flourish as a human. At present, we lack a common understanding of and vocabulary for discussing this, let alone tools to inform policy. How can we evaluate and construct norms that direct technology to our desired uses without first determining what is necessary to protect in our common humanity? Exploring and examining the specific challenges posed by new and emerging technologies will focus our attention on what aspects of human life we cherish and would not wish to see abandoned or transformed by technological innovation. It is worth emphasizing that this holds true not only for emerging technologies, but also for our relationship with existing technologies, like the internet, computers, and smartphones, all of which are having insidious effects on our cognition and relationship with others and the world.[99]

This is a massive task that requires both a limiting ambit and ample freedom and space to explore. There are, of course, a huge number of important

96 Yuval Harari, *21 Lessons for the 21st Century* (New York: Siegel & Grau, 2018), 17.
97 As quoted by Glendon in "Looking for 'Persons' in the Law."
98 Christian Smith, *What is a Person?* (Chicago: University of Chicago Press, 2010), 472.
99 See Nicholas Carr, *The Shallows: What the Internet is Doing to Our Brains* (New York: W.W. Norton, 2011).

issues to research about the relationship between society and technology, but all of these must rest upon some shared, basic assumptions about universal human experience. Exploring the meanings and implications of dignity, an essential common core of humanity, is a useful starting point from which a more nuanced and detailed exploration of human flourishing can begin.

What is Dignity?

Dignity is admittedly a contentious term. Is dignity, as professor and medical ethicist Ruth Macklin has decried, a term too vague and imprecise to be useful?[100] Or is it, rather, essential to any conversation about what it means to exist and flourish as a human being? Or are both of those statements true?

There will be critics of using dignity as an organizing principle for this work. Some will claim that it is too much of an empty vessel, into which users can stuff any number of qualities and values. Others will claim that the word is too vague and bereft of useful meaning. It is true that dignity has a variety of linguistic uses, historical origins, and philosophical foundations. Most dignity-related scholarship tends to approach the meaning of dignity by first tracing and examining its varied historical and cultural roots, from classical Greek and Biblical traditions to Kantian ethics, Hegelian phenomenology, Axel Honneth's "recognition theory," to its usage in international agreements and state constitutions. While this approach is useful and illuminating to a degree, it doesn't result in a single, universally acceptable, pragmatic definition. And yet, in an attempt to distill all of these uses into a definition that fits with each, we could say: *dignity refers to a common aspect of our humanity that is due reciprocal moral respect*.

But if dignity is to be operationalized to inform policy and law, such a definition is inadequate. This relatively empty vessel must be filled with specifics in order to increase understanding and subsequently inform policy. It is, however, a useful starting point, providing us with toeholds and a sense of direction. First of all, it points to something "common" in each of us, regardless of race, color, religion, gender expression, age, national origin, disability, marital status, or sexual orientation. Second, it is an "aspect" of our humanity, not a virtue or value. It is something innate, rather than cultivated. Third, "due

100 R. Macklin, "Dignity is a useless concept," *BMJ* 327, no. 7429 (2003): 1419-1420.

reciprocal moral respect" captures the critical social element of dignity. While it can be argued whether dignity is inherent in individuals or whether it arises via social interactions and recognition, the pragmatic, phenomenological importance of dignity is found in the social dimension. This reciprocal moral respect is relevant to all sizes of social groups, from two individuals, to online chat forums, to relations between nations. A more detailed discussion of the social dimensions can be found in Appendix E.

Not only will an exploration of dignity add to our knowledge of the human experience and our relationship with technology, but it is frankly hard to imagine making informed policy decisions *without* a better understanding and articulation of dignity and human flourishing. In the seminal report *Human Dignity and Bioethics*, St. John's College tutor Adam Schulman states "it is hard to see how ethical standards for the treatment of human beings can be maintained without relying on *some* conception of what human beings are and what they therefore deserve."[101] Schulman continues, "…the march of scientific progress that now promises to give us manipulative power over human nature itself…will eventually compel us to take a stand on the meaning of human dignity, understood as the essential and inviolable core of our *humanity*."[102]

Technology as a Lens

Rather than start with an overly specific, *a priori* definition of dignity that may be culturally and ideologically limiting, starting from the broad definition proposed above we can use the lens of technology to develop a more nuanced understanding of dignity, grounded in common experiences. Examining the impacts of technologies on human experience across cultures allows us to bring the concept of dignity into higher resolution and sharper focus. As these challenges are new and unprecedented, all participants in these discussions will potentially have something useful to contribute in building toward a shared understanding of human flourishing and human dignity, and how they might be undermined (or transformed beyond recognition) by the new and powerful technologies that are either already here or can be discerned over the near horizon. A deeper understanding of dignity then allows us to turn our

101 *Human Dignity and Bioethics*, 15.
102 *Human Dignity and Bioethics*, 17.

lens back on technological innovation and consider tools and frameworks for technology evaluation and governance.

The earlier section on technology proposed six categories of technology's deleterious impact on humans: privacy, alienation, nature of humanity, labor, autonomy and agency, and justice and equity. Each of these impact areas relates to an individual's sense of social worth and belonging, concepts that are intimately connected with dignity.[103] As we conduct research to better understand how these impact areas are related to dignity, we may arrive at new models and tools that will help us both to understand impacts and to operationalize policy.

New models, tools, and frameworks are desperately needed. As discussed in the section on organizational inadequacies, approaching complex, transnational challenges through national frameworks is ineffective. But breaking free from national approaches is difficult without some catalyst. Global governance reforms occur typically in the aftermath of major conflicts or crises. The first two World Wars, the "ozone hole" crisis of the mid-eighties, and the global financial crisis of 2008 are examples of how crises spur changes in global governance. But technological disruption is more insidious and harder to pin down.

Technological breakthroughs arrive not as crises or threats, but as triumphs of human ingenuity and will. Each new advance in computing power, each breakthrough in genetic manipulation, each new method of harnessing the power of subatomic particles is greeted as a victory over nature, often obscuring the potentially negative impacts on society. This is not to imply that technological advances do not bring benefits; the benefits are typically significant. It is the unintended and unanticipated consequences that are a concern. Without a crisis it is difficult to stop and take time to consider technology's multifarious impacts on humanity and build tools for evaluation and control.

An examination of human dignity within the context of new and emerging technologies provides us with a meaningful starting point. Only with a common understanding and set of shared vocabulary can we provide insights and recommendations on which norms and institutional arrangements augment, protect, and encourage a respect for human dignity and human flourishing, and those which detract.

103 See Appendix E.

Policy Relevance

Sustainable progress on entrenched transnational challenges is virtually impossible without some sort of shared ethical foundation and vision for a desired future. Put simply, *social solidarity requires a common moral community,* which, in turn, requires new and inclusive approaches to understanding our common human experience and what it means to flourish as a human being. An exploration of various technologies' impacts on dignity and human flourishing will give us a more nuanced, complete, inclusive, and pragmatic set of meanings and vocabulary necessary to inform a shared vision of a desired future.

Current policy articulations of dignity are too general and broad to be useful in the face of technological disruption. In current public policy, dignity is most often used as a catch-all term meant to encompass essential human rights. Article 1 of the German Basic Law states "(1) Human dignity shall be inviolable. To respect and protect it shall be the duty of all state authority." Rights then flow from this general principle, but the law does not define dignity. It is purposefully vague, malleable, and inclusive. The United Nations' *Universal Declaration on Human Rights* places human dignity at its core, explicitly recognizing dignity's source as "inherent" in all people. U.S. Secretary of State Anthony Blinken emphasized that "human rights and dignity must stay at the core of the international order."[104] While few would disagree with these statements, without a clearer understanding of dignity's meaning and implications, it is either too general to be practically useful or too politically laden to be universally acceptable.

Moreover, this inherent dignity approach is essentially tautological: all humans have dignity; therefore, dignity is inherent in all humans. It doesn't tell us anything about what is at the root of this concept and what detracts from and augments it. It also doesn't shed light on the social dimensions of dignity. It makes effective policy formation nearly impossible.

But technology provides a focusing mechanism through which we can examine more specific meanings and facets of dignity. Technology both reflects human values and has profound effects on our processes of cognition

104 Secretary of State Anthony Blinken virtual remarks to UN Security Council Open Debate on Multilateralism, May 7, 2021, https://www.state.gov/secretary-antony-j-blinken-virtual-remarks-at-the-un-security-council-open-debate-on-multilateralism/.

and what we come to value. In his book *The Shallows*, Nicholas Carr discusses Marshall McCluhan's views on technology stating, "Whenever we use a tool to exert greater control over the outside world, we change our relationship with that world. …an honest appraisal of any new technology, or progress in general, requires a sensitivity to what's lost as well as what's gained. We shouldn't allow the glories of technology to blind our inner watchdog to the possibility that we've numbed an essential part of ourselves."[105] Insofar as technology decreases privacy, autonomy, and justice and equity, increases alienation, and changes the nature of work and humanity, it is affecting human dignity.[106]

There is a vast array of important policy questions related to technology that require a more nuanced and complete understanding of dignity. Some examples are:

- **Biomedical enhancement**: Should there be ethical limits on the use of biomedical knowledge, not to cure illness but to enhance or modify human nature?
- **Age-retardation**: Is it proper to treat aging and death as "just another challenge to be overcome by medical technology"? What are the implications for human dignity of potentially unlimited extension of the human lifespan?
- **Human cloning**: If the cloning of human beings becomes safe and reliable, should it be permissible, and within what limits?
- **Reproductive technology and prenatal screening**: What are the implications for human dignity of using in vitro fertilization and genetic screening to select "ideal" embryos for implantation, growing human infants in artificial wombs, using germ-line genetic modification to "improve" human embryos, and so on.
- **Organ transplantation**: As the technology improves and becomes more reliable, and replacement of failed organs becomes a more routine part of medicine, what rules should govern the gathering of suitable organs? Should healthy individuals be able to sell their organs to be transplanted into others?
- **Human-machine distinction**: Do people have the right to know whether they are interacting with a human or a machine/AI?

105 Carr, *The Shallows*, 212.
106 See Appendices C and E.

- **Alternate and virtual reality (AR/VR)**: How should we address alternate and varied perceptions of reality created in AR/VR worlds?
- **AR/VR data rights**: As these technologies progress to collect highly accurate personal identifiers such as "kinematic fingerprints" (motor patterns), biometric data, and behavioral data, to what extent should users exercise rights and ownership over data, digital identity, and software? What are the rights and freedoms of one's virtual persona, especially in relation to violence and other traumatic experiences? Do the laws, protections, and social norms of the physical world carry over into the virtual world and virtual representations of real people? What is the relationship between one's virtual and physical persona?
- **Algorithmic decisions**: How should an individual's rights be delineated in the face of algorithmic decisions?
- **Beneficial deception**: Should AI be able to deceive a human if algorithms determine that this would work in the subject's best interest?
- **Caregiving robotics and AI**: To what extent should humans be entitled to care by another human?

In their article on the governance of healthcare robots, researchers Zardiashvili and Fosch-Villaronga conclude:

> Human dignity is the ultimate, overarching legal concept upon which all the rights are based and should be the basis of future legal intervention aimed at addressing the governance of robot technology, especially for healthcare. Therefore, we conclude by giving the policy advice to formulate an overarching, omnibus governance solution for robotics that will be based on the concept of human dignity. With this in mind, we acknowledge that furthermore, detailed research is necessary to clarify what dignity means in this connected, ever-evolving, and at the same time, diverse contemporary society and how the uses of robotics may challenge this notion.[107]

107 Lexo Zardiashvili and Eduard Fosch-Villaronga, "'Oh, Dignity too?' Said the Robot: Human Dignity as the Basis for the Governance of Robotics," *Mind and Machines: Journal for Artificial Intelligence, Philosophy and Cognitive Science* 30, no. 1 (January 2020): 139.

Beyond Technology

In addition to helping us navigate the pressing challenges posed by emerging technologies, a deeper exploration of dignity would apply to other policy-relevant areas. As mentioned earlier, approaching transnational challenges solely through national political-economic frameworks is ineffective. If we tackle these challenges based not on a foundation of national sovereignty, but with a shared understanding of human dignity, it may be possible to break new ground on entrenched sources of conflict. Notre Dame sociology professor Christian Smith points out that dignity underpins the "moral and political ordering of human personal and social life."[108] He states that a detailed exploration of dignity would take us largely into "uncharted territory," with implications for virtually all aspects of social policy.[109] In addition to technology governance, these might include climate justice, human rights, social justice, and diversity, equity, and inclusion.

An examination of the effects of technology on dignity can help us draw deeper conclusions about dignity in general and the shared human experience. This appeal to common experience will allow for a more inclusive approach than one based on existing theories that may carry excessive political and ideological baggage. *We can find common ground based on common experiences, despite differences on principles, that may lead to benefits in other areas.* As stated earlier in this paper, the absence of a long-term vision for the world order, and more narrowly for U.S.-China relations, is a huge impediment to a peaceful future. A more nuanced and complete understanding of human dignity can inform such a vision. In short, *a globally acceptable normative vision of the good society, based on a shared understanding of dignity, could provide an essential framework for addressing a wide variety of transnational challenges.*

Conversations in China

One of the objections that will be raised is that the United States and China have very different attitudes towards values and technology ethics. Typical American perceptions of Chinese attitudes towards technology tend

108 Smith, 446.
109 Smith, 488.

to follow a narrative that goes something like this: in order to maintain and extend political control, the Chinese Communist Party is harnessing the powers of technology to create a surveillance state, and exporting that technology to the rest of the world in order to promote its authoritarian model of governance. These worries are then projected onto the future of the global order, as summarized by Ross Andersen in *The Atlantic:* "The emergence of an AI-powered authoritarian bloc led by China could warp the geopolitics of this century."[110]

While there is some truth to such a narrative, it ignores the rich and thoughtful conversations that are happening in China over privacy, data ownership, bioethics, the metaverse, robotics, the future of work, and humans' relationship with technology. The reality is that the Chinese government and broader society are dealing with the same questions and social challenges as are Americans, and are moving even faster on some aspects of governance. To some extent, it is understandable why such a limited understanding of the debate over technology in China persists—there are real concerns about how technology is being used to track dissidents and other purported enemies of the state—but misunderstandings are also due to the fact that these conversations are technologically complex and occurring in Chinese. For those that read Chinese and follow these conversations, there are rich and nuanced debates happening at the governmental, academic, and private levels.[111]

On the regulatory and governance front, China is moving more quickly than the United States. Detailed regulations covering personal information, data security, e-commerce, cybersecurity, and algorithms have all been passed

110 Ross Andersen, "The Panopticon is Already Here," *The Atlantic*, September 2020, https://www.theatlantic.com/magazine/archive/2020/09/china-ai-surveillance/614197/.

111 With the Chinese party-state utilizing technology for social control, including surveillance, discourse control, and monitoring of personal communications, the knee-jerk reaction has been for many analysts to extend techno-authoritarian views to broader Chinese society. In fact, conversations among academics and researchers in China in mirror, in many ways, the conversations happening in Silicon Valley, Brussels, and beyond. Behind closed doors, there is even robust discussion among officials about how to limit the negative impacts of technology. This will be the subject of a separate, forthcoming publication.

in the last five years.[112] The Chinese Supreme Court also issued an important legal interpretation last year on the use of facial recognition.[113]

Ultimately, the effects of new and emerging technologies are not limited by national borders. The reality is that we are all facing these issues together. Every society, including the United States and China, needs to wrestle with difficult questions relating to the right uses and limits of technology. This necessarily involves examining core beliefs about values and human dignity. Taking artificial intelligence as an example, Massachusetts Institute of Technology professor of chemical engineering Bernhardt Trout states "how AI is used isn't just a technical issue; it's just as much a political and moral question. And those values vary widely from country to country."[114]

So, while emerging technologies will be a source of competition and friction between nations, dignity and technology ethics are areas ripe for cooperative exploration, dialogue, and discussion. The additional advantage of focusing on the ethical foundations is that such research can be de-politicized to a greater degree than if the focus were on more immediate technology norms, which are inherently political, though separating such topics completely from ideology is impossible.[115] At a time when other aspects of U.S.-China relations are so fraught and exchange so limited, such dialogue may also lead to unexpected breakthroughs and serve as a foundation for progress in other areas.

112 "Xinxi baohu yu shuju hegui xiangguan falü 信息保护与数据合规相关法律 [Laws Related to Information Protection and Data Compliance]." Zhishi chanquan yu hulianwangfa 知识产权与互联网法 [Intellectual Property and Internet Law]. https://mp.weixin.qq.com/s/6jLHQrJGFCk6cHQ79cSy5w (accessed August 22, 2021) and "Wangluo anquan shencha banfa 网络安全审查办法 [Cybersecurity Review Measures]." Zhongguo hulianwang xinxi bangongshi deng bumen 中国互联网信息办公室等部门 [Cyberspace Administration of China et al]. http://www.cac.gov.cn/2022-01/04/c_1642894602182845.htm (accessed January 5, 2022).

113 "Zuigao fayuan mingque: binguan, shangchang, yinhang, deng jingying changsuo lanyong renlian shibie shu qinquan最高法明确：宾馆、商场、银行等经营场所滥用人脸识别属侵权 [Supreme Court Makes Clear: Misuse of facial recognition in hotels, shopping malls, banks, and other business places constitutes infringement]." Yangshi xinwen 央视新闻 [CCTV]. https://www.thepaper.cn/newsDetail_forward_13777591 (accessed July 30, 2021).

114 Pappas, "Expect an Orwellian future if AI isn't kept in check, Microsoft exec say."

115 The nature of research institutions and the political system in China makes separating the academic from the political very difficult.

Methodology and Research Agenda

The ultimate aim of such a project would be to give to tomorrow's policy makers a better understanding of, common vocabulary for, and policy tools to anticipate and address transnational challenges that threaten human dignity. It would be future-oriented, looking forward to a future that is worth striving for, removing presentism, parochialism, and politics from the discussion as much as possible. Technological disruption would serve as the initial focusing mechanism for exploring the core of dignity, but our hope is that this will have spillover benefits for other areas of transnational concern.

The project should provide "reliable knowledge and understanding about what kinds of social institutions and structures tend to lead toward the thriving of human personhood, on the one hand, and those that tend to obstruct or diminish it, on the other."[116] Harvard professor Herbert Kelman recognized the political difficulty of such an enterprise, but stated "the debate must be continued as part of a long-term effort to evolve and test criteria whose validity is universally accepted."[117]

To move beyond simply an academic discussion about dignity, it will be important to focus on tools and processes that can eventually be utilized by policymakers. Kelman suggested that some initial questions in framing policy relevance are:

- What are the necessary conditions for realizing human dignity?
- What are the criteria for assessing whether policies or institutional arrangements are consistent with human dignity?
- What are the social processes by which human dignity is extended and protected?[118]

We can add to this:

- In what ways is human dignity "thwarted or threatened"?[119]
- How can we respect cultural differences yet share a common conception of dignity?

116 Smith, 487.

117 Herbert C. Kelman, "The conditions, criteria, and dialectics of human dignity: A transnational perspective," *International Studies Quarterly* 21 (1977): 546.

118 Kelman, 535.

119 Gaither et al., 14.

- How does the concept of dignity map onto international relations?
- Can a shared conception of dignity result in both the "fulfillment and inhibition of nationalistic demands"?[120]

While these questions are at the heart of a general understanding of dignity, our approach to providing answers to them will be through the more focused and practical lens of emerging technologies. The purpose of the research would be:

- to undertake fundamental inquiry into the human and moral significance of emerging and future science and technology
- to explore specific ethical and policy questions related to these developments
- to explore possibilities for useful international collaboration on emerging technologies and their impact on human dignity
- through the lens of technology, to find common ground on the meaning and utility of dignity across cultures and disciplines

An inquiry into the ethical implications of technology would ideally go much deeper than the obvious concerns of safety and efficacy; we must prospectively consider what we wish humanly to defend and advance, rather than merely reactively consider the potential consequences of this or that particular technological innovation. The overall goal is to explore the defining and worthy features of human life—features which new technologies may serve or threaten.

120 Kelman, 535.

Structure and Organization

A diverse group of multi-disciplinary thinkers from a variety of nationalities and cultural backgrounds should be assembled to consider these issues. These could include people with expertise in neuroscience, cognitive science, sociology, psychology, anthropology, science fiction, law, bioscience, philosophy, medical and technology ethics, national security, and business. This group would engage in a series of projects—some solo investigations, others collaborative; some aiming at concrete policy recommendations, others more fundamental, exploratory, and philosophical. Each would bring important perspectives to these challenges. As Notre Dame professor Christian Smith states about his discipline, sociology should contribute to "the larger, shared moral and political project of pursuing the telic social good of institutionally and structurally promoting human dignity."[121] Each of the other disciplines listed above should likewise be able to make contributions to these ends.

Drawing from the organizational lessons highlighted in earlier sections of this paper, an effective approach needs to allow for an appropriately lengthy research time horizon, give researchers the time and space to explore amorphous and complex issues, and provide an organizational structure or mechanism that encourages a sense of community and shared purpose. This would most likely a multi-step process, starting with a series of planning meetings and conferences, building up a network, and then providing a more structured organizational home.

121 Smith, 488.

There are a number of existing organizational approaches that could be used as models.

Table 1. Models for structurally promoting human dignity

Model	Description	Advantages	Disadvantages
Janelia Research Campus	Purpose-build a permanent organization	Allows for most customized approach; most likely to result in breakthrough ideas and tools	Heavy fundraising and long planning timeline; hard to course-correct
Department of Defense's Office of Net Assessment	Host a research unit within an existing organization	Faster to establish; potentially comes with funding if parent organization is interested; direct line to policy	Incorporating into existing bureaucracy can be difficult; freedom of research and time horizon potentially limited
Center for Advanced Study in the Behavioral Sciences	University-hosted research center	Provides established "brand" and infrastructure	University bureaucracies burdensome and inflexible; activities may skew academic; office space and real estate limited
Highlands Forum[122]	Network sponsored by existing organization(s)	Relatively easy to establish; allows for testing the waters on policy relevance	Sponsor likely looking for near-term results and reports

122 Richard O'Neill started the Highlands Forum when he was at the Department of Defense to address the difficulty of coming up with new, innovative ideas while within an existing bureaucracy. Not only did the barrage of day-to-day responsibilities overwhelm the ability to set aside time for thoughtful deliberation, but the people around him were all of the same background, giving the same types of ideas. For more information see http://www.pirp.harvard.edu/pubs_pdf/o%27neill/o%27neill-i01-3.pdf.

Table 1. *Continued*

Model	Description	Advantages	Disadvantages
MacArthur Research Networks	Funded research network	Easy to establish; independent; can serve as a proving ground for a new organization	Participants have other day-job responsibilities; hard to build community
Santa Fe Institute	Hybrid organization with combination of resident and networked experts	Starts with meetings and conferences to build momentum before establishing permanent home	Constant search for funding may be time-consuming; existing Santa Fe model focused more on scientific publications
Tobin Project	Flexible network with conference approach	Non-linear and flexible network; less commitment means easier to establish; less funding required	Stronger focus on reports and "output" from meetings may shorten time horizon of issues addressed

Recognizing the start-up nature of this project and practical funding limitations, a hybrid network approach might be a suitable starting point. The network aspect recognizes that participants would not be leaving their day jobs, but regular in-person meetings would build relationships, a sense of community, and allow for cross-disciplinary engagement. It could initially be hosted at an existing organization, as long as it was given sufficient autonomy and shielded from the existing bureaucracy.

One of the important lessons learned from this project is that enabling experts to break free of the "tyranny of the present" is both critical to their ability to engage in long-term thinking about complex problems and an immense challenge. Most experts currently juggle their day-job(s) with a myriad of other responsibilities, including traditional and social media appearances, consulting, and advisory positions, not to mention spending time with community, family, and friends. Figuring out how to provide participants the time and space to focus on complex, long-term problems both with others and alone while operating in a network model is a challenge.

On the one hand, experts need time to reflect by themselves on the questions they see as critical. On the other, time is needed to forge the problem-solving or visioning community essential to building sustainable momentum on both the issues and the organizational initiative. It is worth re-emphasizing the importance of in-person meetings and interactions to this process. Physical meetings between clusters of intellectually rigorous people from diverse backgrounds and disciplines is necessary to achieve innovative, breakthrough ideas and create meaningful progress. The current isolation of experts, both from each other and from experts in other fields, is a major problem—people need to come together where they have an opportunity to give their full attention to thinking about answers to the big, hard questions. For these reasons, we propose starting with a network that also meets in person on a regular, sustained basis.

One option could be to meet, for example, eight times per year for a long weekend, Friday through Sunday. This is similar in concept to a military reserve schedule: one weekend per month, plus one week per year. Participants could fly on a Thursday night to a location that minimized distractions. David Moss, of the Tobin Project, suggests that more remote locations or locations near but not in major cities are ideal, as they remove people from typical distractions and incentivize staying on site.[123] This could be somewhere like Wingspread in Wisconsin, which has not only a suitable location, but a track record of hosting similar conferences and workshops. Janelia Research Campus is another example, which is near Washington D.C., enabling easy transportation, but far enough away to encourage people to stay on site.

Another approach could be to meet in person for one week, four times per year. This would both allow for greater interaction and cross-fertilization of ideas and disciplines and provide enough time for deep, introspective solo work. Another important benefit of this format is that it would permit international travel, enabling participation from around the world. The location would not need to be in the United States; the Rockefeller Foundation's Bellagio Center on Lake Como in Northern Italy, for example, would be well suited to this sort of endeavor. The potential downside of meeting for a week at a time is that it may be more difficult for participants to fully ignore responsibilities back home.

123 Blanchette interview with David Moss, June 10, 2021.

In order to refine this approach, a first step could be to follow the path of the Santa Fe Institute: begin with a workshop, or series of workshops, that convenes key people to discuss both the substantive ideas and the future of the overall endeavor. This would help build momentum and strengthen the case for an extended program. For such an approach to be successful, it is important to have the right combination of people, including: a small core of prominent individuals who can serve both as substantive participants and recognizable names to attract others, a larger number of individuals from a variety of different disciplines and backgrounds who are deeply engaged in and attracted by such work, and potential funders who are interested in these issues. Many of these participants will be self-selecting, recognizing the unique opportunity to work on critical issues in an environment that will allow them to grapple, both individually and collectively, with questions that they have already been wrestling with for some time. The ideal participants are those who are doing this work already and would likely be doing it regardless, but would be more productive and focused if put in a community of similarly interested individuals with organizational and structural impediments removed.

Now is the right time for such an endeavor. Taking stock of our current geopolitical environment, the state of the world order, and the rapid pace of technological change, we are desperately in need of new ideas and new approaches. The consequences of failure are at best unappealing and at worst devastating. The world is undergoing momentous change and if we don't have a clearer idea of where we want to go, to channel Yogi Berra, we might not get there. And at the bilateral level, the relationship between the United States and China is not going to improve if efforts are not made to find common ground—put simply, finding the "we" in U.S.-China relations. With the wide array and nature of global challenges we face, from the impacts of technology, to climate change, to social justice, to global peace and stability, the same can be said of the rest of the world. Working actively towards a shared understanding of dignity, beginning with the impacts of technology, is surely not the only way, but would be a positive start.

Appendix A
Emerging Technology Taxonomy

What do we mean by new and emerging technologies? While this should be straightforward, we were unable to find a comprehensive taxonomy of new and emerging technologies and their potential impacts. We therefore created one in the hopes that it could serve as a useful framework through which to better understand the individual and collective impacts on the military and societal spheres.

We compiled a list of key technologies, dividing them into five technology areas.[124]

Table 2. Major Technology Areas and Technologies

Information & Communications Technology • Artificial Intelligence • Augmented/Virtual Reality • Cloud Computing • Distributed Ledger Technology • Electromagnetic Spectrum • Internet of Things • Neuromorphic Engineering • Quantum Technology • Social Media	**Space Technology** • Alternative Propellants • Satellite Technology	**Biotechnology** • Genomic Engineering • Synthetic Biology
	Advanced Materials Technology • Additive Manufacturing • Advanced Synthetics • Metamaterials • Nanotechnology	**Earth & Energy Technology** • Advanced Energy Storage • Advanced Renewables • Hypersonic Technology

124 We attempted other approaches to categorizing technologies, such organizing technologies by their underlying function, but this did not result in as clear a picture of the technologies' pragmatic impacts. Appendix B provides background on our methodology.

We then subdivided those five areas of technology into technology components, derivatives, and capabilities. We listed applications for each, in both the public and military realms. Finally, we attempted to categorize the impacts of these technologies and applications, broken down into military and societal.[125] There is an apparent incongruity to this approach, in that we focus on the potential positive military benefits and the negative social consequences. This is intentional, however, as the political drivers of technology development are, to a great extent, military applications, whereas governance concerns are driven primarily by the potentially negative social consequences. This approach naturally obscures or ignores the enormous societal benefits that stem from new technologies, including benefits to health, security, communications, efficiency, equity, productivity, access to information, and addressing climate challenges, among others. Our argument is simply that those benefits are self-evident; the potential societal benefits and military applications drive technology development.

One of the additional challenges we faced was how to best catalogue and visualize this data. We ended up with an enormous workbook containing multiple spreadsheets that, while useful for providing a holistic digital view and keeping all our data, sources, and iterations in one place, was not conducive to displaying in print format. It also had more data than we needed for the purposes of this paper. Ultimately, a single comprehensive view of the data eluded us, so we have provided in the pages that follow detailed breakdowns of each major technology.

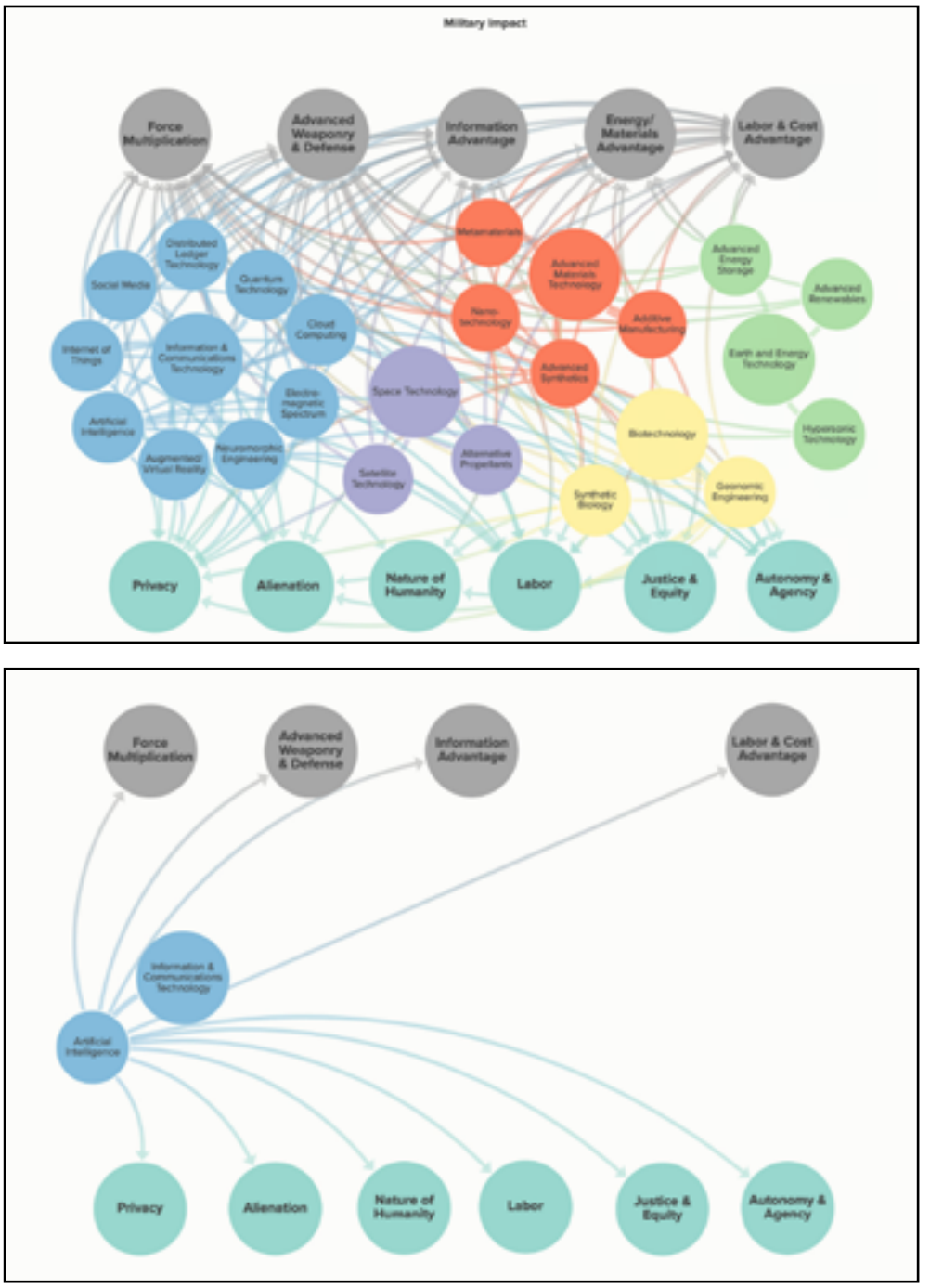
We also experimented with a variety of methods and tools for visualizing the military and societal impacts. We found the clearest to be the chart presented earlier in the main body of the paper (Figure 1, page 14), but also found the Kumu.io platform to be a useful way to interact with the data and relationships in a more dynamic fashion (Figures 3 and 4, page 73).

Detailed Technology Breakdowns

The tables on the following pages present a detailed breakdown of each area of the technology taxonomy, organized according to the major technologies in each technology area.

125 In this project we use the term "societal impact" to cover and encompass "human impact."

Figures 3 and 4. Kumu enables dynamic visualizations of the entire system of relationships (Figure 3, top), as well as the ability to isolate individual technologies or impact areas (Figure 4, bottom).



Technology Area	**Information & Communications Technology**
Technology	**Artificial Intelligence**
Components, Derivatives, Capabilities	Machine Learning, Computer Vision, Artificial Neural Networks, Natural Language Processing, Robotics, Speech Recognition, Expert Systems, Big Data Processing, Predictive Analytics, Automation, Reinforcement Learning, Cognitive Computing, Sensing and Perception, Deep Learning
General Applications	Autonomous Vehicles, Autonomous Systems, Gaming, Chat Bots, Search Engines, Sentiment Analysis (Opinion Mining), Text Analysis, Facial Recognition, Stock Market Analysis, Health Monitoring, News Categorization, Weather Prediction, Language Comprehension and Interface, Spam Filters, Derivatives Training, Software Testing and Automatic Cyber-Vulnerability Testing, Machine Translation, Medical Diagnosis, Hearing Aids, Mood Analysis, Brain-Machine Interfaces, Recommendation Systems, Robotic Locomotion, Targeted Advertising and Customer Segmentation, DNA Sequence Classification, Computer-Vision Object Recognition, Bioinformatics and Chemical Analysis, Legal Case Research, Space/Underwater Exploration, Resource Extraction
Military Applications	Autonomous Vehicles and Weapons, Information Operations, Human-Machine Teaming, C4ISR, Internet of Military Things/Internet of Battlefield Things, Anti-Access/Area-Denial (A2/AD) Operations, Simulation Modeling and Synthetic Environments, Biometrics, Cyber Operations and Defense, Decision and Planning Support, Defense Logistics and Supply Chain, Predictive Analytics
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Labor & Cost Reduction
Societal Impact Categories	Privacy, Alienation, Nature of Humanity, Justice & Equality, Labor, Autonomy

Technology Area	**Information & Communications Technology**
Technology	**Augmented/Virtual Reality**
Components, Derivatives, Capabilities	Spatial Augmented Reality, Simulations, Mixed Reality
General Applications	Smart Glasses, Heads-Up Display/ Head-Mounted Display, Film and Media, Entertainment, E-Sports, Mobile Gaming, Mobile Holographic Display, Biometric Identification, Spatial Augmented Reality, Industrial Manufacturing, Commerce and Retail Marketing, Simulated Training Environments, Simulation Modeling, Navigation, Social Interactions Platforms, Education
Military Applications	Autonomous Vehicles and Weapons, Information Operations, Human-Machine Teaming, C4ISR, Internet of Military Things/ Internet of Battlefield Things, Anti-Access/ Area-Denial (A2/AD) Operations, Simulation Modeling and Synthetic Environments, Biometrics, Cyber Operations and Defense, Decision and Planning Support, Defense Logistics and Supply Chain, Predictive Analytics
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Labor & Cost Reduction
Societal Impact Categories	Alienation, Labor

Technology Area	**Information & Communications Technology**
Technology	**Cloud Computing**
Components, Derivatives, Capabilities	Hybrid Cloud, Multi Cloud, Cloud Storage, Big Data Analytics
General Applications	Enterprise Resource Planning, Testing and Development, Disaster Recovery, Data Backup, Mobile Cloud Computing, Anti-Virus Applications, E-Commerce, Cloud Gaming, Application Services
Military Applications	Autonomous Vehicles and Weapons, Information Operations, Human-Machine Teaming, C4ISR, Internet of Military Things/ Internet of Battlefield Things, Anti-Access/ Area-Denial (A2/AD) Operations, Simulation Modeling and Synthetic Environments, Biometrics, Cyber Operations and Defense, Decision and Planning Support, Defense Logistics and Supply Chain, Predictive Analytics
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Labor & Cost Reduction
Societal Impact Categories	Privacy, Alienation, Labor, Autonomy

Technology Area	**Information & Communications Technology**
Technology	**Distributed Ledger Technology**
Components, Derivatives, Capabilities	Smart Contracts, Consensus, Anonymity and Privacy, Shared Ledger
General Applications	Cryptocurrency, Digital Assets, Provenance in Supply Chain Management, Smart Contracts, Cyber Security, Identity Authentication, Financial Management and Banking, Intellectual Property, Management, Cross-Border Payments, Internet of Value, Art
Military Applications	Global Data Sharing and Coordination, Critical Infrastructure Control, Secure Data Control and Exchange, Weapons Release, Defense Logistics and Supply Chain Operations, Security, and Validation, Procurement Auditing, Contract Management
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Labor & Cost Reduction
Societal Impact Categories	N/A or Unclear

Technology Area	**Information & Communications Technology**
Technology	**Electromagnetic Spectrum**
Components, Derivatives, Capabilities	Radio Waves, Microwaves, Infrared, Ultraviolet, X-Rays, Gamma Rays, LIDAR
General Applications	Data Transmission, Video and Teleconferencing, Satellite Communications, Navigation, Meteorological Services, Spectroscopy, Mobile Phones and Applications, Streaming, Wi-Fi, Broadcast, Lasers (Laser Isotope Separation, Electrical Switching, Remote Sensing, Imaging and Diagnostics, Optical Communications, Plasma Chemistry, Chemical Analysis for Nuclear Security and Energy Applications)
Military Applications	Communications, Situational Awareness, Intelligence, Surveillance, Reconnaissance (ISR), Command and Control (C2), Radar and LIDAR, Signals Intelligence (SIGINT), Environmental Sensing, Early Missile Detection, Air and Missile Defense, Missile Guidance, Precision Targeting and Strikes, Electronic Warfare, Spectrum Manipulation and Signature Management, Directed Energy Weapons, Anti-Access/Area-Denial (A2/AD), Space Defense and Weaponry, Non-Intrusive Aircraft Inspection, 5G Communications, Weapons System Datalink
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Labor & Cost Reduction
Societal Impact Categories	N/A or Unclear

Technology Area	**Information & Communications Technology**
Technology	**Internet of Things**
Components, Derivatives, Capabilities	Edge Computing, Smart Sensing Systems, Peer-to-Peer Networks
General Applications	Smart Devices, Systems, and Applications, Disease Monitoring and Prevention, Therapeutic Delivery, Smart Manufacturing, Agriculture, and Industry Applications, Smart Grid and Energy Management, Surveillance, Control Systems, Logistics and Supply Chain Management, Intelligent Transport Systems, Media and Entertainment
Military Applications	Autonomous Vehicles and Weapons, Information Operations, Human-Machine Teaming, C4ISR, Internet of Military Things/ Internet of Battlefield Things, Anti-Access/ Area-Denial (A2/AD) Operations, Simulation Modeling and Synthetic Environments, Biometrics, Cyber Operations and Defense, Decision and Planning Support, Defense Logistics and Supply Chain, Predictive Analytics
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Labor & Cost Reduction
Societal Impact Categories	Privacy, Alienation, Labor, Autonomy

Technology Area	Information & Communications Technology
Technology	**Neuromorphic Engineering**
Components, Derivatives, Capabilities	Interpretation and Autonomous Adaptation, Massively Distributed, Parallel Information Processing, Analog and In-Memory Computing, Memory-Processor Co-Localization, Deep and Covolutional Neural Network Accelerator, Embedded Intelligence
General Applications	Pattern Recognition, Classification, Prediction, Object Identification and Change Detection, Autonomous Control, Edge Computing, Robotic Vision and Control Sensors, Biomedical and Biosignal Engineering, Perception Engineering, Medical Assistive Applications (incl. Retinal Implant and Sensory Substitution), High-Speed Serial Interfaces, Electronic Design Automation, Authentication System, Cybersecurity
Military Applications	Autonomous Vehicles and Weapons, Information Operations, Human-Machine Teaming, C4ISR, Internet of Military Things/ Internet of Battlefield Things, Anti-Access/ Area-Denial (A2/AD) Operations, Simulation Modeling and Synthetic Environments, Biometrics, Cyber Operations and Defense, Decision and Planning Support, Defense Logistics and Supply Chain, Predictive Analytics
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Labor & Cost Reduction
Societal Impact Categories	Privacy, Labor, Autonomy

Technology Area	**Information & Communications Technology**
Technology	**Quantum Technology**
Components, Derivatives, Capabilities	Computing, Sensing, Communication, Cryptography, Measurement
General Applications	Artificial Intelligence, Computational Chemistry, Quantum Encryption, Secure Communication, Quantum Teleportation and Networking, Financial Modeling and Arbitrage, Weather Forecasting, Particle Physics, Cybersecurity & Cryptography, Logistics Optimization (Quantum Annealing), Distributed Sensor Networks, Drug Design, Protein Folding
Military Applications	Autonomous Vehicles and Weapons, Information Operations, Human-Machine Teaming, C4ISR, Internet of Military Things/ Internet of Battlefield Things, Anti-Access/ Area-Denial (A2/AD) Operations, Simulation Modeling and Synthetic Environments, Biometrics, Cyber Operations and Defense, Decision and Planning Support, Defense Logistics and Supply Chain, Predictive Analytics
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Labor & Cost Reduction
Societal Impact Categories	Privacy, Justice & Equality, Labor, Autonomy

Technology Area	**Information & Communications Technology**
Technology	**Social Media**
Components, Derivatives, Capabilities	Social Networking, Wikis, Media and Content Sharing, Blogs and Microblogs
General Applications	Digital Marketing, E-Learning, News and Information Sharing, Digital Marketplace, Community Building
Military Applications	Autonomous Vehicles and Weapons, Information Operations, Human-Machine Teaming, C4ISR, Internet of Military Things/ Internet of Battlefield Things, Anti-Access/ Area-Denial (A2/AD) Operations, Simulation Modeling and Synthetic Environments, Biometrics, Cyber Operations and Defense, Decision and Planning Support, Defense Logistics and Supply Chain, Predictive Analytics
Military Impact Categories	Information Advantage, Labor & Cost Reduction
Societal Impact Categories	Privacy, Alienation, Justice & Equity

Technology Area	**Space Technology**
Technology	**Alternative Propellants**
Components, Derivatives, Capabilities	Solar Electric Propulsion, Electrothermal, Ion Drive, Arcjet, Pulsed Plasma, Hall-Effect, Microsatellite Propulsion
General Applications	Space Access and Exploration, Micro-propellants, Orbital Propulsion, Human Space Flight, Payload Delivery, Deep Space Propulsion and Probe, Proximity Operations, Noncooperative Capture and Deflection
Military Applications	Similar to general applications
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage
Societal Impact Categories	N/A or Unclear

Technology Area	Space Technology
Technology	**Satellite Technology**
Components, Derivatives, Capabilities	Intelligence, Surveillance, and Reconnaissance (ISR), Space Command, Control, and Communications, Remote Space Sensing, Earth Observation, Cubesats
General Applications	Positioning, Navigation, and Timing (PNT), Space Traffic Management, Space Situational Awareness, Space Search and Rescue, Space Sustainment Operations, Image Gathering on Planetary Probes and Rovers, Structural Deformation Detection, In-Orbit Spacecraft Surface Damage Analysis, Failure Diagnostics, Temperature Monitoring, Radiation Measurement, Space-Based Kill Assessment, Debris Management, Solar Radiation Management
Military Applications	Missile Warning Systems, Space Flight Safety/Collision Avoidance, Antisatellite Weapons, Communication Jammers, Sensor Dazzler Detection, Space Battle Management, Visual Spacecraft Monitoring, Smart Instrumentation Point (SIP)
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage
Societal Impact Categories	Privacy

Technology Area	**Biotechnology**
Technology	**Genomic Engineering**
Components, Derivatives, Capabilities	Conditional Gene Expression Control
General Applications	CRISPR, Drug Discovery, Therapeutics, Diagnostics, Disease Models, GMO, Gene Drives, Biomaterials
Military Applications	Commodities Materials, Specialty Materials, Sensing, Biological and Chemical Weapons, Sensor-Active Materials, Clandestine Sensors, Distributed Tag, Track, and Trace Systems, High-Strength Polymers, Stealth Materials, Corrosion-Resistant Coating, Biological Computing, Data Storage, Cryptographic Materials, Cognitive, Physical, and Socio-Emotional Performance Enhancement, Cybernetic Replacement, Healing Enhancement
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Energy Advantage, Labor & Cost Reduction
Societal Impact Categories	Privacy, Alienation, Nature of Humanity, Justice & Equity, Labor, Autonomy

Technology Area	Biotechnology
Technology	**Synthetic Biology**
Components, Derivatives, Capabilities	Biological Sensing, Therapeutics, Synthetic Genomics
General Applications	CRISPR, Human Modification and Augmentation, Artificial Tissue Engineering and Regeneration, Cryogenics, Biomimetics, Cybernetics, Enhanced Mechanical Integrity and Restoration, Genetically Engineered Crops, Reflective Crops, Synthetic Bio-Fuels and Materials, Fine Chemicals Production, Drug and Vaccine R&D, Production, and Delivery, Bioremediation, Disease Mechanism and Drug Target Identification, Pharmaceuticals
Military Applications	Commodity Materials, Specialty Materials, Sensing, Biological and Chemical Weapons, Sensor-Active Materials, Clandestine Sensors, Distributed Tag, Track, and Trace Systems, High-Strength Polymers, Stealth Materials, Corrosion-Resistant Coating, Biological Computing, Data Storage, Cryptographic Materials, Cognitive, Physical, and Socio-Emotional Performance Enhancement, Cybernetic Replacement, Healing Enhancement
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Energy Advantage, Labor & Cost Reduction
Societal Impact Categories	Privacy, Nature of Humanity, Justice & Equity, Labor, Autonomy

Technology Area	**Advanced Materials Technology**
Technology	**Additive Manufacturing**
Components, Derivatives, Capabilities	Rapid Prototyping, Rapid Tooling, Rapid Manufacturing, Direct Digital Manufacturing (DDM), Part Consolidation
General Applications	Industrial Parts and Equipment Manufacturing (plus localization), Medical Implants and Prosthetics, Architectural Design and Parts, Modeling
Military Applications	Supply Chain Management and Responsiveness, Sustainable Military Operations, Contingency Resupply Operations and Parts Availability, Prosthetics
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Labor & Cost Reduction
Societal Impact Categories	Justice & Equity, Labor

Technology Area	Advanced Materials Technology
Technology	**Advanced Synthetics**
Components, Derivatives, Capabilities	Synthetic Polymers, Synthetic Alloys, Plastic Composites, Synthetic Crystals, Self-Healing Polymers, Smart Polymers, Electron Conducting Polymers, Shape Memory Polymers and Alloys, Piezoelectric Materials, Self-Sensing Composite Materials, Embedded Fibers
General Applications	Synthetic Rubber, Lightweight Sensors, Batteries, Scaffolding, Fault-Tolerant/Wear-Resistant Coatings, Electronics, Transport, Flexible LED, Conductive Ink, Smart Textile, Embedded Electronics and Semiconductors, Synthetic Gels, Polymer Supercapacitor, Radioactive Waste Storage and Disposal
Military Applications	Protective Gear, UAVs, Sensor Systems, Vehicles
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Labor & Cost Reduction
Societal Impact Categories	Privacy, Alienation, Justice & Equity, Labor, Autonomy

Technology Area	Advanced Materials Technology
Technology	**Metamaterials**
Components, Derivatives, Capabilities	Meta-surfaces, Transformation Optics, Electromagnetic Cloak, Optical Data Processing, Quantum Chips and Processors
General Applications	Neuro-regeneration, Tumor-Targeted Imaging, Electrical Field Stimulation Therapies, Electrochemical and Optical Biosensors, Photonic Chips, Optical Coating Technologies, Geoengineering
Military Applications	Aeronautic Acoustics, WMD Materials Manipulation, Healing Enhancement
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Energy Advantage, Labor & Cost Reduction
Societal Impact Categories	N/A or Unclear

Technology Area	Advanced Materials Technology
Technology	**Nanotechnology**
Components, Derivatives, Capabilities	Nanomaterials, Nano-Energetics, Nano-Manufacturing, Nano-Metrology, Nano-Bioengineering
General Applications	4D Printing, Electronics & IT: Transistors, Magnetic Random Access Memory, Quantum Dot Ultra-HD Displays and Television, Flexible Electronics (Ultra-Responsive Hearing Aids, Semiconductor Nanomembranes, Antimicrobial Coating, Photovoltaics, Conductive Ink), Medical & Healthcare (Nanomedicine, Imaging and Diagnostics, Gene Sequencing Technology, Therapeutics, Vaccine Delivery), Energy (Fuel Production & Consumption, Energy Harvesters, Batteries, Carbon Nanotubes, Desalination, Pollutant Cleaner, Mechanical Filtration, Chemical and Biological Agents Detection, Thin Film Solar Panels, Fuel Additives, Catalytic Converters), Nanoengineered Infrastructure and Construction Materials, Nanosensors, Manufacturing and Structural Material, Cellulose Conversion, Bone and Neuro Tissue Engineering, Bio-Printing, Molecular Motors, Nanomachines, Nanoengineered Brain-Machine Interfaces (BMI), Smart Dust, Geoengineering
Military Applications	Nano-Explosives, Chemical & Biological Weapons, Bioterrorism, Nuclear Activity Monitoring and Detection, Electromagnetic Stealth Technology, Nano-Engineered Land, Air, Space Structures
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Energy Advantage, Labor & Cost Reduction
Societal Impact Categories	Privacy, Nature of Humanity, Justice & Equity, Labor, Autonomy

Technology Area	**Earth and Energy Technology**
Technology	**Advanced Energy Storage**
Components, Derivatives, Capabilities	Harvesting, Storage, and Generation Technologies, — Solid-State Batteries, Photovoltaics, Perovskite-Structures, Piezoelectric Materials, Salt-Based Energy Storage, Distributed Systems, Carbon Capture and Sequestration, Direct Air Capture,
General Applications	Electric Vehicles, Pacemakers, Wearables, Wireless Sensor Networks
Military Applications	Endurance Drones, Lightweight, Flexible Solar Panels
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense, Information Advantage, Energy Advantage, Labor & Cost Reduction
Societal Impact Categories	N/A or Unclear

Technology Area	Earth and Energy Technology
Technology	**Advanced Renewables**
Components, Derivatives, Capabilities	Geothermal Energy, Biomass and Biofuels, Hydro and Ocean Power, Wind, Solar, Hydrogen, Green Ammonia, Synthetic Fuels, Electrofuels, Next-Generation Nuclear Technology (Fusion, Thorium, Advanced Light and Heavy Water Reactors, High-Temperature Gas Reactors, Molten Salt Reactors, Sodium-Cooled Fast Reactors, Lead-Cooled Reactors, Tristructural-Isotropic-Fueled Reactors, Fast-Neutron-Spectrum Reactors, Advanced Pressurized Water Reactors, Pebble Bed Reactors)
General Applications	Next-Generation Energy Conversion and Power Generation Systems, Advanced Fuel Cells and Battery Technologies, Catalytic Chemistry and Biochemistry, Waste and Carbon Dioxide Remediation, Efficient Energy Management Systems, Nuclear Powered 3D Printing
Military Applications	Next-Generation (Resilient and Mobile) Energy Conversion and Power Generation Systems, Advanced Fuel Cells and Battery Technologies, Efficient Energy Management Systems, Nuclear: Small and Micro Nuclear Reactors, Directed-Energy Weapon Power Systems, Space Flight and Naval Propulsion Systems, 3D Printing, Hydrogen: Vehicles and Transport Systems, Stealth Submarines, Ballistics, UAVs
Military Impact Categories	Force Multiplication, Energy Advantage
Societal Impact Categories	N/A or Unclear

Technology Area	**Earth and Energy Technology**
Technology	**Hypersonic Technology**
Components, Derivatives, Capabilities	N/A or Unclear
General Applications	Payload Delivery, Space Access, Time-Critical Targets, High-Speed Transportation
Military Applications	Hypersonic Glide Vehicles, Hypersonic Cruise Missiles, Conventional Prompt Global Strike, Tactical High-Speed Strike Capability
Military Impact Categories	Force Multiplication, Advanced Weaponry & Defense
Societal Impact Categories	N/A or Unclear

Appendix B:

Background & Methodology

At the outset of this project we recognized that emerging technologies will have significant impacts on both national security and on society and human flourishing. But in order to determine which technologies would have the greatest impact, and in which areas, we needed to create a more standardized technology taxonomy.

We reviewed the literature and compiled technology categories used across various think tank, research, and government documents, expecting natural categories to emerge. We ended up facing several challenges:

- There is no standardized way of talking about and organizing technologies across different organizations and documents. Variations in the usage of terms like applications, capabilities, enablers, and core technologies made compilation and side-by-side comparisons difficult.
- Individual documents lacked a systematic method for categorizing different technologies. For example, lethal autonomous weapons might be placed alongside biotechnology, or big data alongside artificial intelligence. However, technologies of interest are not necessarily directly comparable. Some serve as core underlying capabilities while other sit closer to the application layer.
- The sources that do succeed in creating more structured categories begin in the outer layer with end uses, applications, and component technologies. As a result, there are numerous overlaps between categories. For example, supply chain management crosscuts the Internet of Things, blockchain, artificial intelligence, and nanotechnology among others. This resulted in a crowded picture of the technologies involved.

For these reasons, we could not easily delineate the relationships and implications of these technologies with the existing categories available in the literature.

To solve this, we used technical and scientific papers, academic journals, and information from national laboratories to decompose each technology of

interest into its components, derivatives, and applications. This gave us the borders of each technology and a map of relationships to organize the technologies into the broadest categories for comparison without sacrificing details or precision of our categories. In this way, we created a tree that shows the boundaries between technologies and the many branches of applications while grouping them into families, or bundles of technology domains.

Despite our best efforts, our categorization still has limitations, and throughout the progress of our work we gained an appreciation for the existing literature and the attempts of our predecessors. To situate the landscape of technologies in a more comprehensive but precise way, we had to identify and decompose the broadest categories of technology into component capabilities or technologies, derivative capabilities, and applications. This posed another set of challenges:

- The ways in which certain technologies have entered the public discourse raised significant obstacles. An ideal taxonomy would break down each technology into a common set of components. Unfortunately, familiarity with and interest in these details are uneven across the technologies and resist standardization. For example, under quantum technology, we have the components computing, sensing, and communication, which form the core of quantum capabilities. Approaching genomic engineering in this manner would give us something along the lines of computational modeling, genetic logic, DNA synthesis and assembly, and directed evolution. Most of our audience is far less familiar–and interested–in the latter. On the other hand, the literature on artificial intelligence and its related technologies has become widely dispersed in the public discourse, which may explain why components of artificial intelligence such as big data analytics and machine learning are frequently given equal status to artificial intelligence.
- Some technologies don't lend themselves well to neat partitions between capabilities and applications. The capabilities and applications themselves may be ambiguous. This may be because the scholarly discourse and research has not yet matured or that capabilities have not made their way into clear use-cases and applications. For synthetic biology and genomic engineering, in particular, genomic engineering is both a technology of interest and a component capability of synthetic biology.

- The decomposition of the technologies allowed us to capture and organize much of the existing literature, but this doesn't mean that we have exhausted every technology that may have an impact on military and society/human flourishing. We were bound to make a trade-off between the depth and the breadth of this taxonomy.

Despite these many challenges, by starting from the underlying technology rather than use-cases or applications, we were able to create a practical technology taxonomy that is closer to "mutually exclusive, collectively exhaustive" (MECE) principles. We have attempted to create minimal overlap between the combined components and derivative capabilities across the technologies. By grouping families of technologies in technology areas, we have also situated cross-cutting applications squarely within the context of a single technology domain without losing sight of their cross-domain effects.

Our goal was not to create a taxonomy simply for taxonomic purposes, but we put significant thought and energy into identifying and organizing the technologies of interest such that the taxonomy reflects the technical contours and relationships in order to achieve a level of systematic accuracy. This taxonomy isn't complete or depth-intensive, nor was it intended to be. Our purpose was simply to look for a way to better understand and visualize the military and societal implications of technologies in order to inform the rest of this project.

Appendix C:
Societal Impact Categories

Privacy: Privacy allows for the expression of our individuality. It is necessary for freedom of expression, thought, association, creativity, and experimentation. It also allows us to engage with each other socially in an autonomous fashion.

Alienation: Humans are social creatures. While technology can make certain tasks more efficient, it can also increase social isolation and alienation. Alienation results from the inability to control significant and basic aspects of our lives, a feeling of estrangement from the social forces that dictate our lives, and the breakdown of social ties and cohesion.

Nature of Humanity[126]: What makes a person a person? At what point does artificial and biological augmentation push a being to become post-human? At what point does artificial intelligence take on roles traditionally occupied by humans? Redesigning human biological structure alters our definition of humanity. Artificial intelligence gives some human qualities to non-human entities and objects.

Justice and Equity: Access to technology and its resultant benefits will not be spread equally or equitably. This has ramifications for economic distribution, societal structure, justice, and political representation and resilience.

Labor: Technology will cause large numbers of workers to become irrelevant. This threatens not only the individuals themselves, but society and political structures—particularly democratic ones. The nature of much labor will also change, leaving humans less connected with final products and lacking in productive, meaningful, and satisfying work.

Autonomy and Agency: Autonomy and agency refer to our existence as something more than biological shells and automatons; we make our own choices about ourselves and have the moral freedom to do as we see right. Autonomy and agency are threatened when we feel like mere instruments of something beyond our control.

126 The question of whether to include "nature of humanity" is worth further consideration. Despite seeming like an obvious area of impact, to what extent would we care about the nature of humanity if it didn't impact any of the other categories?

Appendix D

Military Impact Categories

Force Multiplication: This amplifies capabilities through a combination of synergetic attributes without requiring greater mass or volume of resources. It enables numerically inferior forces to prevail through elements such as leadership, morale, new strategy and tactics, and relative combat effectiveness. New measure and countermeasure dynamics will emerge. Innovations in organizational logic and strategic doctrines can produce game-changing tactical and strategic advantages. Force multipliers include: surprise, stealth, range extenders, all-condition capabilities, low-visibility capabilities, counter-electronic defense, coordination mechanisms, trust, alliances, energy efficiency, and efficient defense production.[127]

Advanced Weaponry and Defense: The integrated battlefield will demand seamless interoperability and system resilience. Advanced battle systems and platforms will reflect this shift with increasing autonomy and connectivity of new and legacy technologies across a common architecture. The next generation of weapons and defense applications enhance stealth, non-kinetic, precision, and autonomous capabilities aimed at securing or disrupting integrated, multi-domain command and control targets and operations.

Information Advantage: Information advantage involves securing multi-domain command and control, battlefield awareness, and decision dominance over the networked environment while denying, degrading, corrupting, or destroying the enemy's information assets. This includes the ability to project a fusion of kinetic and non-kinetic power through means of electronic warfare, psychological operations, deception, information and physical attacks on information targets. To a large extent, future wars will be fought over control and integrity of data and information. War and peace will become increasingly indistinguishable.[128]

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127 Vinod Anand, "Impact of Technology on Conduct of Warfare," *Strategic Analysis* 23, no. 1 (April 1999), https://ciaotest.cc.columbia.edu/olj/sa/sa_99anv02.html.

128 *Strategic Appraisal: The Changing Role of Information in Warfare* (Santa Monica: RAND Corporation, 1999), https://www.rand.org/pubs/monograph_reports/MR1016.html; and "Information Warfare," *Naval Postgraduate School Center for Information Warfare and Innovation*, https://nps.edu/web/ciwi/info-warfare.

Energy Advantage: Energy is both a strategic weapon and a resource. Developments in energy technology seek to minimize the requirements of mission operations and delivery and maximize performance and power for infrastructure and weapons systems. Advancements in energy production, storage, and generation technology seek to close supply vulnerabilities by optimizing output, efficiency, and resilience. The maturation of directed energy weapons adds a new dimension to kinetic and non-kinetic warfare.

Labor and Cost Reduction: Cost- and labor-reducing technology enhances either input or output. Technology promises new materials, energy sources, computational and machine capabilities, and cutting-edge weapons and defense applications that reduce human and non-human capital and costs to achieve superior results. Efficiencies may include new concepts in logistics, force employment, and force structure enabled by cost-cutting innovations in equipment, weaponry, and infrastructure.

Appendix E

The Social Dimensions of Dignity

While experts disagree on the meanings and origins of dignity, I believe the practical relevance to policymakers centers on the social dimensions of dignity.

Ethical standards and norms of behavior all have a social foundation, whether in families, local communities, nations, or across religions. How we behave depends on the social feedback we receive based upon commonly accepted norms. It is our mutual acceptance of these norms that allows us to be a part of a social community. If we act and treat others within the community in accordance with those norms, then we can reasonably expect that we will be accorded the same treatment. When accepted standards of behavior are transgressed, when we are treated in a manner inferior to others within that same community, we feel disrespected, giving rise to feelings of alienation and offense. Why treat all others in one way, but treat me more harshly? Is it because I am less valued and inferior? This creates a feeling of resentment and spurs me to try to regain respect as an equal, which, in practice, is often through a concerted effort to demonstrate superiority.

But why should I feel this way? Can I be satisfied without social recognition from others? The sociological and anthropological answer appears to be no. We do not exist, in any practical sense, as atomistic individuals free from society. We are relational, social beings. H. Rowan Gaither recognized, in his 1949 report for the Ford Foundation, "Men live together whether they want to or not; all are thrust, from birth, into an immense network of political, economic, and social relationships."[129]

We obtain our rights because we are considered by others to be part of a social collective which confers rights on its members: rights only matter in society and in relation to other people. This status of being recognized as an equal member of a social group, due reciprocal moral respect, is at the core of dignity. One may be able to argue that humans are born with inherent dignity, but dignity is pragmatically meaningless if it is not conferred socially through recognition or debased through insult. Dignity is felt most acutely when it

129 Gaither et al., 19.

is injured, though a self-aware individual can also recognize the feeling of well-being and belonging when dignity is recognized.

Our identities are acquired and shaped socially. I am only a distinct person in a community of others; I have a relational identity based on a categorical status. This experience is described by Jim Davis, the protagonist in W.E.B. Du Bois's short story *The Comet*, where Jim does not feel human until he is "seen" by the woman, ostensibly the only other person then left on earth. One day he is invisible, literally feeling "not human," and the next he is revealed to her as an equal, deserving of human dignity and respect.[130] Another way to put this is that we are other-oriented; we have reciprocal self-definition. If we are not acknowledged by others, then our identity breaks down.

A 2014 study on the effects of solitary confinement found that without human contact individuals go through a process of self-dissolution, where, without social reference or feedback, they lose their sense of self:

> "The person subjected to solitary confinement risks losing her self and disappearing into a non-existence…." It is important, however, to specify precisely what aspects of self are at stake in such a statement. Guenther (2013, p. xiii) gives a better indication when she asks: "How could I lose myself by being confined to myself? For this to be possible, there must be more to selfhood than individuality.… Solitary confinement works by turning prisoners' constitutive relationality against themselves." That is, solitary confinement disrupts the *relational self* by disrupting primary and secondary intersubjectivity, and the intercorporeality essential to social interaction.
>
> The practice of solitary confinement is not, as some of the original prison administrators thought, a way for the prisoner to return into self–"The inmate was expected to turn his thoughts inward…."–a rehabilitation through isolation with oneself (Smith, 2006, p. 456; see Guenther, 2013, p. xvi). Such a proposal reflects a traditional concept of self as an isolated individual substance or soul that benefits from introspection. If, in contrast, the self is relational, then solitary confinement, by undermining intersubjective relationality, leads to a destruction of the self. Stripping away the possibility of

130 W.E.B. Du Bois, "The Comet" in *Darkwater: Voices from within the Veil* (New York: Schocken Books, 1969).

> primary intersubjectivity–leading to the experience of depersonalization–goes to the very basic level of the *minimal embodied self*.[131]

This phenomenon is at the root of an approach to identity and dignity based in Hegel, but more fully developed by German philosopher Axel Honneth, now referred to as recognition theory. In short, recognition theory posits that our identity is fundamentally socially derived; our social identity is based on recognition by another person as a being deserving equal moral treatment and respect.

Thus, dignity is both something essential in all humans and a social construct. Notre Dame sociology professor Christian Smith posits that "dignity is a real emergent property of personhood."[132] It is part of the fabric of our social existence. *Dignity can thus be thought of as the socially emergent part of personhood—the fundamental essence of being human in society.* Dignity matters primarily within social contexts. A hermit living apart from society does not feel more or less dignified depending on the weather, climate, reactions from animals, or other non-human social relationships. As Aristotle stated in his classic of political philosophy, a person "who is in need of nothing through being self-sufficient is no part of a city, and so is either a beast or a god."[133] From a pragmatic perspective, we don't need to appeal to a definition or theory of inherent human dignity, either based on Western liberal values or a theistic attribute. Dignity is a construct of our social identity, and it is about that social context which policymakers should be concerned.

This social recognition theory of identity makes the concept of dignity extendable to nations and groups: it is hard to deny that social life and the social lives of countries are driven to a significant degree by concerns over dignity and respect.[134] The vast majority of social conflict, from the individual level to that of nations, can be traced to this drive and desire for recognition.

Bringing this back to the U.S.-China relationship, since 2012 the government of the People's Republic of China has repeatedly called for basing

131 Shaun Gallagher, "The cruel and unusual phenomenology of solitary confinement," *Frontiers in Psychology* (June 2014), https://www.frontiersin.org/articles/10.3389/fpsyg.2014.00585/full.

132 Smith, *What is a Person?*, 444.

133 Aristotle, and Carnes Lord, *Aristotle's Politics* (2nd ed.) (Chicago: The University of Chicago Press, 2013), Book I chapter 2.

134 This dynamic, as well as other implications of the desire for recognition, was explored by Francis Fukuyama in his classic *The End of History and the Last Man.*

relations with the United States on, *inter alia*, a principle of mutual respect (相互尊重). At the core of this idea is that the Chinese Communist Party needs to be first recognized as a legitimate counterparty, equal in standing and stature to the U.S. government, in order to engage in fruitful negotiation and cooperation. Due to contentious differences on human rights, ideology, and geostrategic goals, this idea of mutual respect is hard for the U.S. government to accept, but it is not surprising, based on a social theory of dignity, that the Chinese would demand this. How can Chinese representatives reasonably be expected to engage in good faith if they are constantly derided for their ideology, political system, and inferred political illegitimacy? Conducting research and exchange on dignity and technology with Chinese experts, along with those from other countries, may provide useful entry point for building a foundation of shared values that can inform a more stable political framework for U.S.-China relations and global order.

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Foreign Policy Institute

ISBN 978-1-947661-15-8