MIT Stephen A. Schwarzman
College of Computing

MIT Schwarzman College of Computing Task Force

Working Group on Social Implications and Responsibilities of Computing

Final Report

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OVERVIEW

As computing increasingly affects every aspect of society, the field of computer science is becoming responsible for a growing number of systems that affect the balance between individual rights vs. the common good, privacy vs. openness, efficiency vs. explainability, and traditional vs. emerging forms of work. We have an opportunity to address these emerging challenges by transforming computer science into something fundamentally new. It is a crossroads similar to the moment in the 1950s when MIT created the field of engineering science from engineering.

MIT has a distinct opportunity to refashion computing, with societal, ethical, and policy considerations woven into its conception, by creating a comprehensive, world-leading experience dedicated to:

- Developing and advancing research into fundamental issues of computation.
- Training students to analyze and articulate the challenges that computing creates and/or influences.
- Designing and building the policy and technical solutions of the future.

Throughout our internal and external scan, our working group was struck by 1) the enormous potential and need to aggressively address and incorporate research and teaching on the societal implications of computing and 2) the profound cultural and structural inertia and, at times, barriers preventing precisely this kind of work at MIT and elsewhere. Integrating ethical, social, and policy analysis into the core of the Schwarzman College of Computing (SCoC)—and into MIT's vision for the future of computing—is not a question of tweaking around the edges. It will require sustained vision and dedicated investment in:

- Fostering new research and scholarship methods.
- Championing students and faculty engaged with these topics, which are traditionally less integrated in computer science.
- Weaving this vision into the heart of MIT's core mission.

GUIDING PRINCIPLES

Habits of Mind and Action

Curricular approaches should be dedicated to the creation of habits of mind and habits of action and to fostering the development of those habits among students, challenging them with continual opportunity to critically evaluate and reflect on the societal implications of their work. With these habits of mind and action, students will learn to design systems that meet the needs of societies around the world and lead public consideration of how to address the many challenges and opportunities computing brings to society. The SCoC will need to build a range of new methods and spaces to develop language and modes of thought to articulate these issues.

Integrating Ethical, Social, and Policy Analysis to Construct Solutions

As a leading engineering institution with world-class social science and humanities and a tradition of multidisciplinary collaboration, MIT has a pivotal opportunity to make leadership contributions to the social, ethical, and policy challenges facing the world by integrating consideration of these issues with the development of new computing technologies. Establishing and prioritizing interdisciplinary structures, which include rigorous methodologies derived from the liberal arts, humanities, social sciences, and other disciplines, will prove critical in activating and sustaining habits of mind and action. The SCoC must serve as a catalyst in facilitating complex interdisciplinary actions.

Reach Everyone: Ecology of Diverse Courses and Learning Opportunities to Inspire Experimentation

A successful approach to teaching the societal implications of computing should:

- Engage every student in a substantive way.
- Offer a range of avenues for ethical exploration.
- Foster in-depth research and scholarship.
- Cultivate a culture and spirit of experimentation.

Prioritization of Collaborative Spaces

To instill the desired habits of mind and action and collaboration, it is essential that scholars of the social implications of computing, including those who are not computer scientists, have physical and intellectual collaborative spaces within the SCoC.

POSSIBLE UNSUCCESSFUL FUTURES

In addition to envisioning our goals, the working group thought through possible unsuccessful futures. Fundamental challenges, risks, and barriers exist within the MIT community that must be addressed (with both short-term and long-term perspectives) to achieve success with this endeavor. Our group identified the following examples of future situations that would fall short of achieving our desired goals:

- Incorporation of ethical and societal perspectives into education and research is conceived of as a service that is delegated to, and provided by, a unit outside the SCoC or is realized in a manner that is perceived as lower prestige within the SCoC and wider MIT community.
- Our efforts spur the development of a new discipline/practice that fails to achieve the SCoC's intended interdisciplinary and collaborative vision—for example, a siloed discipline focused on the scholarly study of the societal and ethical implications of computing without reach across our educational and research missions.
- We remain in our current state—societal and ethical considerations remain peripheral to the work of the SCoC.

CONSTITUENCIES

Core to our success is acknowledging that no one institution, organization, or discipline currently possesses full insight into the systems needed for the future nor fully understands the wide range of societal needs. As a result, we embrace an approach of extensive collaborations, both within MIT and beyond, to achieve excellence and to help lead such collaborations. The contributions and needs of the following constituencies, among others, are integral to our efforts:

- Employers are eager for students who possess strong critical-thinking habits of mind and who have developed reflective practices and intellectual skills bridging computing, humanities, and social science. Across sectors, ranging from Silicon Valley technology companies to public interest organizations, employers have emphasized the need for graduates who have the robust tools and vocabulary to evaluate the societal consequences of technological choices.
- Policymakers, regulators, and public interest groups look to universities to develop the next stage of computation capabilities and are looking to MIT to fill the current gap in policy research, guidance, and leadership. They view MIT as responsible for training future policymakers and emphasize the urgency of these issues.
- Researchers across disciplines, including many of our own students, are very excited about new areas of research within computing, including questions regarding accountability and explainability that cross disciplines. They worry that peer institutions are working more diligently than MIT is to capture these budding areas.
- MIT faculty and students are excited about the broad commitment to ethics and societal challenges but worry that it will require new investments and a need to prioritize curriculum that will result in difficult trade-off decisions. They speak of peers and supervisors who see policy and/or ethics as a distraction from the real work.

DEFINING OUR TERMS: ETHICS, SOCIETAL IMPLICATIONS, AND POLICY

In considering the social implications and responsibilities of computing, we identify three broad analytic frames: ethics, societal implications, and policy. Each brings different intellectual background, research methods, and educational approaches. We offer a working understanding of how each frame may apply to the SCoC's mission in research and education. The wide ranging impact of computing on society necessarily motivates the study of ethics, societal implications and policy on a range of issues, from inequality, the future of work, and innovation, to political discourse, national security, and privacy. We also offer an illustrative example of how these different habits of mind and action inform the consideration of one among many leading challenges in computing: privacy.

Ethics

Drawing on moral philosophy, ethics guides us in determining what is the right or just course of action for individuals, groups, organizations, or society at large. In considering privacy questions, ethics can help us understand whether a particular use of personal data is proper, whether an individual engineer ought to participate in the design of a system that raises privacy risk, and how privacy law ought to consider allowing or prohibiting the use of personal data where it puts human dignity at risk.

Societal Implications

Many fields of social science—from history of technology, to sociology and anthropology, to economics and political science, just to name a few—can help illuminate the past and potential effects of computing technology on individuals, organizations, and society. All these disciplines have much to teach about the implications of computing for privacy, both with respect to the lives of individuals and the broader collective effect of intensive collection and use of personal data. How will individual participation in society change with different privacy rules? How will market mechanisms govern use of personal data? How do different system designs change user's privacy perceptions and choices?

Policy

Policymakers, computer systems designers, and scholars of the ethical and societal implications of computing depend on one another in many respects. Policymakers will look to the research produced at the SCoC for guidance. And the SCoC can train the next generation of leaders in computing to:

- Take policy needs into account when designing systems.
- Contribute to the development of well-informed policy frameworks that govern plans, rules, laws, and methods of computing.
- Develop new techniques enabling systems to meet society's requirements as expressed in law and policy.

Policymakers will look to social scientists who study computing for insights of use to the policymaking process. In the complex task of developing and implementing privacy laws, the SCoC can contribute:

- Systems that meet privacy policy needs.
- Social science that informs the privacy legislation choices made by law makers.
- Guidance to companies that face the increasingly complex task of meeting society's privacy expectations.

KEY IDEAS

The transformation of MIT through the SCoC represents an unprecedented opportunity to coevolve new educational and research approaches to meet the challenges that accompany emerging computing technology. Starting with—but not limited to—the SCoC, MIT is positioned to pioneer a new approach to engineering education and research that prepares our engineers and scientists to analyze and articulate societal and ethical considerations, as well as to pursue cross-disciplinary approaches to developing both policy and technical solutions. This holistic approach gives MIT a distinct advantage over other universities where efforts focus primarily on either research initiatives or cross-disciplinary curricular approaches for undergraduates. That includes those institutions that link curriculum and research around one problem space, such as ethical challenges, societal challenges, or policy challenges and solutions.

The SCoC will intellectually enrich us all—existing faculty and educators, new cross-disciplinary research and teaching staff, and graduate and undergraduate students. The success of MIT's effort will be demonstrated by its ability to close the cross-cultural vocabulary gap, develop a shared understanding among disciplines, and create further depth and scope for the emerging use of computer science in research and education.

POTENTIAL STRUCTURES AND FRAMEWORKS

A combination of top-down, center-out, and bottom-up approaches are required to create a durable structure. The top-down and center-out approaches are institutionally created to (1) prioritize our values structure and (2) serve as a catalyst by facilitating and nurturing ongoing collaborations. The bottom-up approach is organic by nature, resulting from collaborative efforts initiated by faculty and students. Our analysis indicates that the majority of successful efforts arise from bottom-up efforts that are then ultimately sustained and nurtured by departmental faculty.

Extrapolating lessons learned from best practices across a wide range of fields, our working group identified the need for malleable structures, processes, and incentives to enable short-term impact while building towards a long-term vision. To ensure that we capture the collective understanding developed through this process, we have aggregated here a list of potential options that could be activated to bring the SCoC's vision to fruition.

TOP-DOWN CONSIDERATIONS

Institutional Commitment, Alignment, and Prioritization

- Develop any approach as a live field of study and research; prioritize it as a critical component of MIT's values structure.
- Pioneer and operationalize as a working model through a plurality of approaches that leverage MIT's distinctive strengths. The advantage of integrating various disciplines lies in the diverse methods they offer to think, ask, listen, analyze, and address problems; inclusion of disciplines and practices can't appear as bolted-on.
- Prioritize ethical, policy, and societal considerations; cultivate a culture in which faculty and students who focus on these considerations are empowered and positively recognized by the scholarly community for developing these habits of mind and action.
- Develop heightened awareness of system-wide issues that currently dissuade adoption of integrated structures and models (e.g., [dis]incentives on tenure track).
- Incorporate various design methodologies and practices (value-sensitive design, human-centered design, etc.) to ensure that ethical, policy, and societal considerations are deeply embedded in technology conception and development.
- Empower the new dean with a specified number of faculty appointments to (1) expedite the desired vision of the SCoC and (2) achieve interdisciplinary hiring and promotion.
- Secure investment to foster the longer-term nature of this transition.

Structures

- Consider creating a dedicated unit centered on ethical, societal, and policy considerations that brings together internal and external scholars, perhaps for year-long residencies or longer terms, and includes practitioners from industry and public interest organizations to collaborate on real-world issues.

- Consider creating permanent public engagement constructs with numerous constituencies; consider a funded center with government, industry, broader civil society, etc.
- Develop an incubator to empower groups of faculty and students from diverse disciplines to engage on topics with unknown lifespans (5–10 years) prior to establishing a new unit in the SCoC. Example: Data Science Commons at UC Berkeley.

Faculty, Staff Hiring, and Development

- Include tasks/records/clarifications to ensure social, ethical, and policy considerations are prioritized during the faculty hiring process (similar to existing processes for female and under-represented minority candidates).
- Foster an environment that ensures that interdisciplinary faculty enjoy equivalent privileges to those of traditional tenured faculty. Example: career progression and promotion opportunities, approval of PhD students, etc.
- Develop innovative approaches to link academic disciplines with practical applications to bring an interdisciplinary approach to fruition. Examples: (1) faculty members with nontraditional academic careers to serve as catalysts (Stanford) and (2) the clinical education model in law in which faculty work on case studies and practical applications that are analogous to MIT Professors of Practice.
- Consider deploying and supporting interdisciplinary faculty across departments.
- Develop innovative ways to scale while appropriately supporting faculty and students. Examples: (1) Develop a stable research staff that works on policy, ethics, and social considerations with a full or partial course load year-round. (2) Leverage graduate students and postdoctoral researchers from diverse student populations for curriculum creation, (3) Engage the undergraduate community in TA opportunities (i.e., UC Berkeley model) (4) Leverage existing resources currently serving a cross-functional role, e.g., MIT Libraries' successful efforts to incorporate diversity, inclusion, and social justice into the Libraries' educational and research mission.

Curricular Investment

Current Landscape

- At MIT's peer institutions, we see an increasing effort to add an ethics or social science element to existing computer science classes. For example, the Harvard EthiCS curriculum relies on graduate students in philosophy to teach ethics modules within many CS classes.
- Several classes in SOE and many in SHASS directly address the ethical, cultural, and policy questions raised by developments in computing. MIT NEET (New Engineering Education Transformation) is developing an ethical engineering curriculum drawing on the recent work of a philosophy postdoc and MIT Media Lab graduate student. MIT SEE (Society, Ethics, and Engineering) teaches ethics for engineers to more than 10% of MIT undergraduates and has a course version focusing on the ethical issues in CS/AI.
- Our peer institutions (e.g., Stanford, UC Berkeley) offer large interdisciplinary classes co-taught by faculty from different departments (e.g., Stanford: Computers, Ethics, and Policy).
- MIT has experimented successfully in teaching partnerships with leading law schools (Georgetown and Harvard) enriching our student body, creating research collaborations across disciplines, and helping our peer institutions to bring deeper technical perspective to their scholarship.

Potential Pathways for MIT Going Forward

- Catalyze and sustain undergraduate classes with embedded ethics and societal considerations.
    - Currently at MIT, some professors working on computing voluntarily add material that touches on the ethical and societal implications of the course content; however, there exists no systematic source of support for this work. Instructors frequently feel, reasonably, that these questions are in opposition to their content objectives. Instructors often are disconnected from the cutting-edge research on the social implications of computing. It's essential that we find innovative ways to scale up embedded ethics/social science.

    - The ways the current communications requirement is embedded in the undergraduate curriculum provides a potential model for embedded ethics/social science, as many recognize that these concerns extend far beyond computing.
    - We consider the embedded ethics/social science model far better at advancing the SCoC's mission than one stand-alone ethics class, required or optional.
- Create new first-year big-idea classes that introduce students to the issues of ethics, societal implications, policy, and computing.
- Develop SHASS concentrations that address societal implications of computing and technology.
- Develop SCoC concentrations that address the ethical and societal implications of computing and technology.
- Develop certificate programs for undergraduates and graduate students, which are highly marketable for employment.
- Require all UROPs to engage with these issues and questions (e.g., within their proposals or via a final report), and/or create UROPs focused on ethical and societal considerations.
    - A critical component of learning for almost all students, undergraduate and graduate, is through mentored research, such as UROPs, theses, research assistantships, externships, etc. Neither UROP programs nor classes foreground professionalization of students as ethical actors. (Examples: MIT Political Science: Preparation for Travel Abroad in Dangerous Countries. From SA+P: Thinking About the Needs of the Client from the Beginning and Reiterative Process of External Critique.)
- Encourage and incentivize the development of new collaborative courses and research projects conducted jointly with peer institutions such as law schools (e.g., in the model of current joint courses with Georgetown Law School).
- Consider expanding the graduate student experience to include mandatory components based on topics of interest; students attend lectures in other fields, TA, critique papers, do research, develop mini-courses, participate in IAP, etc.

Physical Space

- Consider designation/renovation of a number of spaces across campus where different cohorts meet longitudinally (faculty, fellows, TAs, project teams) to build communities and maintain visibility of efforts across campus. Physical continuity and adjacency are critical to fostering ongoing collaboration. Intentionality is needed regarding the design of how we work, live, and collaborate.
    - Examples: lounges, coffee machines, white boards, spaces to ready/study, shared offices, flexible/temporary workplaces.

Moonshot Ideas

Pursue moonshot ideas by launching large projects that highlight the work MIT aims to do. Examples: small scale–$50K Bose Competition, MIT $100K Competition; large scale–MacArthur Foundation’s $100M and Change. Example: A topic related to work of the future.

CENTER-OUT CONSIDERATION

Continuum Approach to Reflect Broader Aspirations

- Bridge education and research efforts to foster habits of mind and action across a continuum: (1) At the individual actor level: values in design and practice and how a designer should be guided by ethics and responsible design in making system design decisions such as choosing algorithm features. (2) Psychology and sociology: consideration of how technology interacts with people as individuals, in groups, and institutions. (3) Policy, economics, environmental impact, and sustainability: understanding power dynamics, political theory, and institutional and societal factors and forces.

Supported by Departmental Structure but Anchored by Senior Faculty Ambassadors

- Account for time-intensive nature and allocate accordingly (i.e., resources, incentives for teaching).
- Identify senior faculty ambassadors; well-respected people are needed to earn instant credibility and act as champions to navigate internal barriers and the cultures of various departments.

Horizontal Committee

- Identify and recruit external thought leaders to engage on complex challenges. Committee to also include students (undergraduates and PhDs) and faculty.

Cross-Disciplinary Projects with Faculty and Students

- Create a formal program to catalyze new faculty collaborations. Example: MIT faculty visit other internal departments for an extended period, e.g., faculty to spend 1–2 months embedded in the SCoC or another department for exploratory work or focused on a project.
- Engage external thought leaders from industry, government, and NGOs (including producers of technology, consumers, and regulators) for an extended time to exchange knowledge, organize events, etc. as part of a visiting fellows program. Example: The Knight Science Journalism Fellowship Program at MIT.

Rotational Programs, Funded Fellowships, and Action Learning

- Create rotational programs or fellowships within industry and/or government that fund students for one to two years post-graduation in spaces that engage in ethical and societal issues. Examples: Stanford's funded fellowships, Google's Public Policy Fellowship Program.
- Arrange for students to take courses on societal and ethical issues in organizational computing, which include projects in which students work with organizations to address those problems. Example: MIT Sloan Action Learning.

- Arrange for students to take courses in the societal implications of technology, policy, and political science then work with government organizations. Example: MIT Washington, DC, Summer Internship Program.

Graduate Research and Postdoctoral Fellowships (Various Tiers)

- Establish requirements to take courses on topics. Weekly lunches, etc. will bring fellows together.
- Partial Research Assistant Graduate Fellowship (~2 months support) with requirement to take ~2 classes and incorporate ethical, social, and policy considerations into thesis topic. Receive certificate.
- Teaching Assistant Fellowship Program to train and engage TAs in longer-term commitments to catalyze cross-disciplinary classes, e.g., bioethics class model.
- Establish immersive graduate or postdoc fellows program that is fully funded to conduct cross-disciplinary research in ethics and social responsibility.

Funded Institution(S) Staffed with Teams Equipped in Understanding Ethical, Policy, and Social Considerations

- Establish entity with researchers and faculty from multiple disciplines to provide quick-cycle feedback, advice, and guidance to students, postdocs, and faculty on new research proposals. Structure to provide a personalized framework to help researchers further analyze and articulate ethical and social considerations grounded in their specific research. Ensure support is available including faculty, staff, research assistants, etc.

SCoC Undertakes Self-Volunteering to Include Statements in Research Proposals and Publications

- Serve as a model internally and externally to develop and embrace new accepted practices that require all research proposals and papers to include considerations regarding technology implications. Establish mechanisms and stand-up resources to reduce friction and foster habits of mind and action. Example: Several research communities and countries are currently promoting this approach—e.g., the ACM Future of Computing Academy call for papers and proposals to include consideration of all reasonable broader impacts, both positive and negative.

BOTTOM-UP CONSIDERATIONS

Foster Faculty Collaboration Through Creative Flexibility

- Encourage faculty in the development of new courses, curriculum, and interdisciplinary degree programs, including cross-disciplinary PhD programs. Example: Stanford 's multiple JD/CS PhD candidates.
- Intentionally seed faculty from different departments in co-teaching courses.

Develop a Collection of Curated Case Studies from a Variety of Disciplines

- Provide faculty and students with concrete ways of recognizing examples of ethical, policy, and societal implications from other fields and disciplines.
- Leverage these efforts into a course or series of lectures showcasing different cases with visiting faculty from other disciplines.
- Focus on technical case studies for engineers and designers with different goals from those endemic to Harvard Business School case studies. (Note the recent $5M gift to Harvard Business School from Schwarzman Research Fund to develop case studies on the implications of AI for industries, business, and markets.)

Funding Student-Led Collaboration Retreats

- Provide funding to support retreats among MIT's graduate school community to create collaborations.

Creating Theme-Based Departmental Lectureship Awards

- Recognize faculty through high-profile events and receptions where lectureship awards are bestowed for work on themes related to ethical, policy, and societal implications.

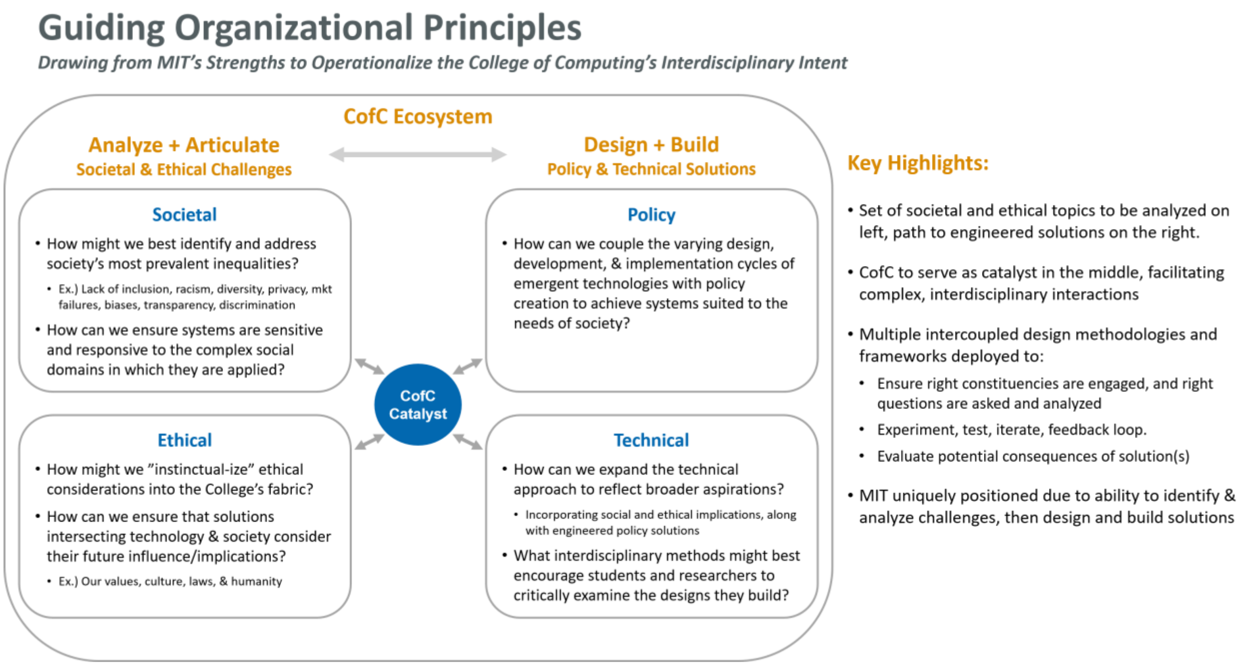
Present Mini-Symposiums, Workshops, and Other Events

- Examples*:* (1) Arthur Miller Lecture on Science and Ethics, an endowed lecture series hosted annually at MIT, and (2) Morison Lecture and Prize in Science, Technology, and Society, an endowed prize-lectureship awarded annually at MIT.

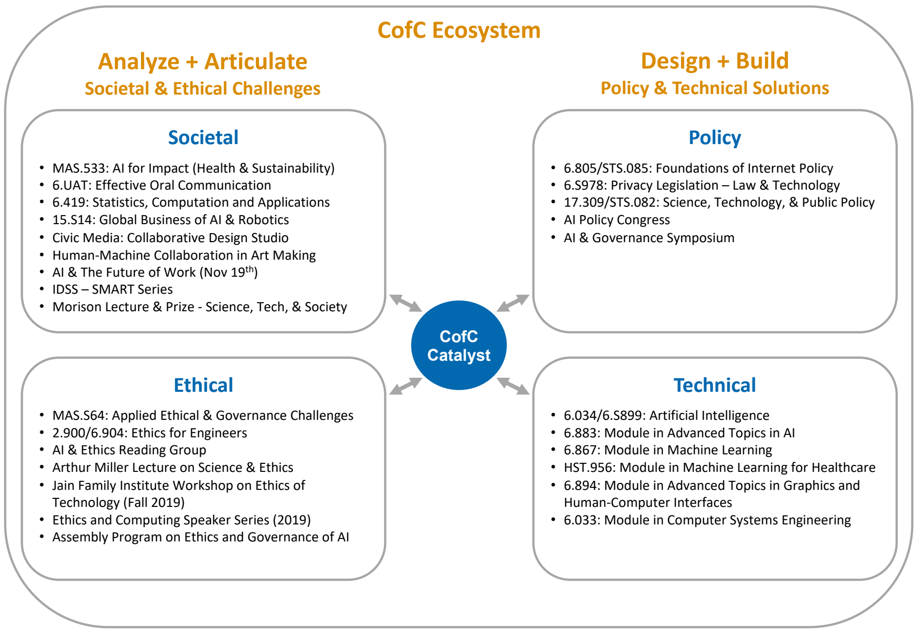
Appendix

ORGANIZATIONAL FRAMEWORK

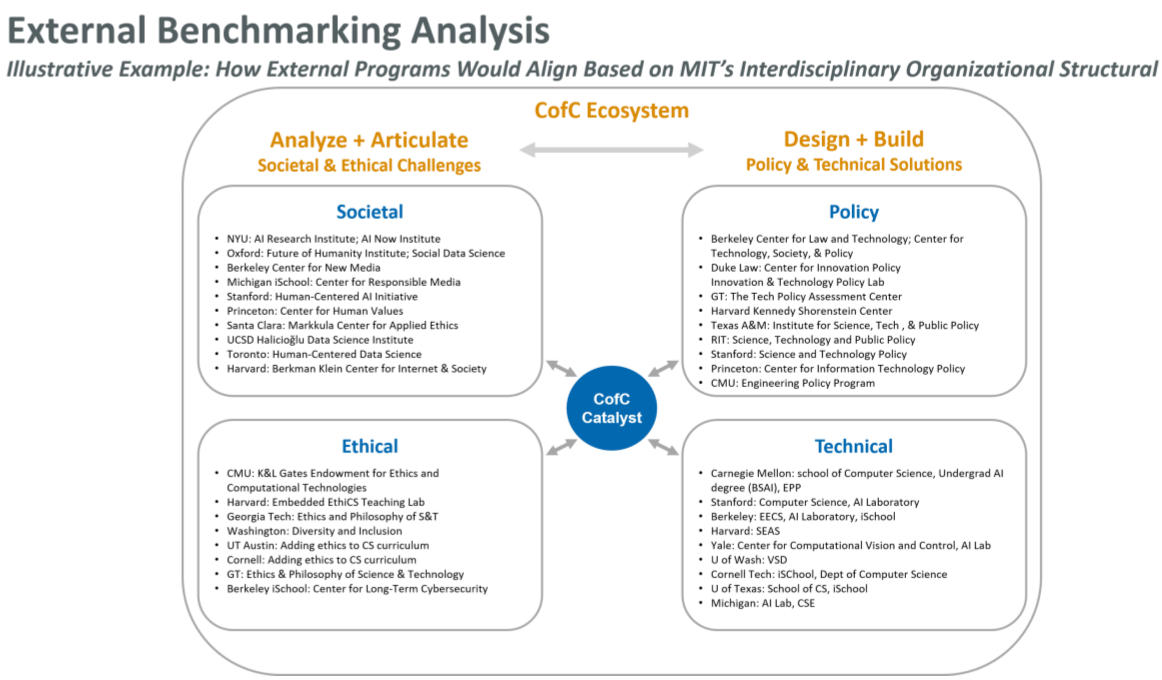
The working group developed the following organizational frameworks and organizational principles informed by our external benchmarking efforts and internal scan of current activities.

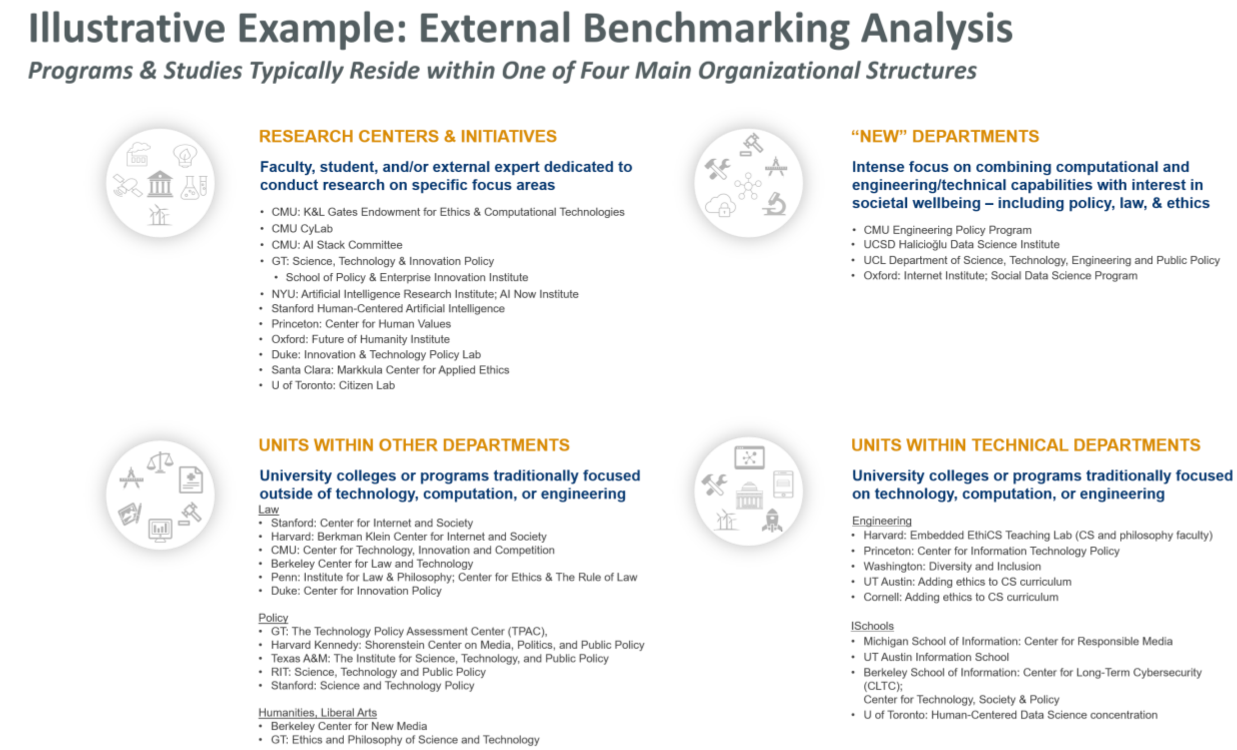


Internal MIT Efforts



BENCHMARKING OF EXTERNAL ACTIVITIES





External Benchmarking Informed by Outreach Efforts:

- Barbara Grosz | Harvard University | Higgins Professor of Natural Sciences - Computer Science
- Batya Friedman | University of Washington | Professor in the Information School + Adjunct Professor in Computer Science + Adjunct Professor in Human-Centered Design | Pioneered Value Sensitive Design (VSD)
- Helen Nissenbaum | Cornell Tech | Professor (Philosophy) in the Information Science Department
- Helen Scott | NYU | Professor of Law and Founder & Co-Director of the Leadership Program on Law & Business
- Jeremy Weinstein | Stanford | Professor of Political Science
- David Culler | Berkeley | Interim Dean For Data Sciences & Information + Former Chair of EECS
- Barbara van Schewick | Stanford Law School | Professor of Law + Director of Stanford's Center for Internet & Society
- Larry Kramer | Stanford University | President of the William & Flora Hewlett Foundation + Former Dean of Stanford Law School

- Keith Winstein | Stanford University | Assistant Professor of Computer Science (former MIT student)
- Cathryn Carson | Berkeley | Associate Dean of Social Sciences
- Deirdre Mulligan | Berkeley | Associate Professor in the School of Information at UC Berkeley, faculty Director of the Berkeley Center for Law & Technology,
- David Danks | Carnegie Mellon University | Head of Philosophy Department
- Doug Sicker | Carnegie Mellon University | Department Head of Engineering Policy Program (EPP)
- Nick Feamster | Princeton University | Deputy Director - Center for Information Technology Policy + Professor of Computer Science
- Shannon Vallor | Santa Clara University | Professor of Philosophy - Technology + Google's part-time Ethicist
- Rob Reich | Stanford University | Professor of Political Science
- Reid Simmons | Carnegie Mellon | Autonomous Systems Professor
- Allison Simmons| Harvard University | Professor of Philosophy

SOCIAL IMPLICATIONS AND RESPONSIBILITIES OF COMPUTING WORKING GROUP MEMBERS

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