Schwarzman College of Computing Task Force
Working Group Reports—Executive Summary

August 5, 2019

It could be argued that the launch of the MIT Schwarzman College of Computing (SCoC) represents the most profound institutional change to MIT since the mid-20th century when MIT created two new schools—the School of Humanities, Arts, and Social Sciences (SHASS) and Sloan—and invented the first interdepartmental research laboratory (the Research Laboratory of Electronics). The SCoC has been designated as an MIT “college” to signal the distinct vision it represents—a wholly new approach to computing and computer science: connect researchers across disciplines to generate solutions that could advance nearly every aspect of human endeavor.

By tapping the ability—and the agility—of each area of MIT to accelerate multidisciplinary computing solutions, the SCoC has the potential to fundamentally transform the Institute. It will enhance our understanding of the social and ethical implications of computing, and it will enable MIT to further its leadership in shaping a more just, humane, and productive future.

The SCoC is supported by a $1 billion commitment for new research and education in computing. That commitment is made possible by a $350 million foundational gift from Stephen A. Schwarzman, chairman, CEO, and cofounder of the global asset management and financial services firm Blackstone.

SCoC TASK FORCE WORKING GROUPS

To help guide the creation of the SCoC, MIT Provost Marty Schmidt convened a task force in February 2019 to explore key aspects of the SCoC’s formation. The task force comprised five working groups—Social Implications and Responsibilities of Computing, Organizational Structure, Faculty Appointments, Curricula and Degrees, and Computing Infrastructure.

During the four months that followed, more than 100 working group members, including faculty, students, and staff, devoted thousands of hours to internal and external research, weekly...
discussions, and a delineation of options for structures, policies, programs, and infrastructure that will enable the SCoC to fulfill its mission. The work of these groups was informed by numerous community and faculty forums as well as a web-based Idea Bank open to the MIT community. Working group members also met with many individual Institute units.

The groups also weighed the extent to which their ideas would:

1. Facilitate collaboration and promote integration across MIT departments and other units in curricular planning and research.
2. Acknowledge and maintain respect for the demonstrated expertise of colleagues.
3. Increase MIT competitiveness with regard to faculty and student recruiting and retention.
4. Sustain fair and appropriate allocation of resources (space and funding), appointments, and teaching.
5. Incorporate flexibility to accommodate dramatic shifts and evolutionary changes.
6. Avoid benefiting one group at the expense of others or creating an unusual burden on any unit.

MIT and SCoC leadership teams are deeply committed to establishing a welcoming and inclusive climate within the SCoC. The efforts of the working groups included multiple interactions with and guidance from relevant MIT staff experts in culture and climate.

Read the description of each working group’s mandate on the SCoC Task Force website.
SOCIAL IMPLICATIONS AND RESPONSIBILITIES OF COMPUTING (SIRC)—REPORT OVERVIEW

The SIRC working group identified a number of guiding principles for its report:

- Create habits of mind and action focused on societal responsibility among various constituencies and foster those habits of mind among students.
- Integrate ethical, social, and policy analyses into the development of new computing technologies.
- Develop an ecology of diverse courses and learning opportunities that inspire experimentation.
- Establish physical spaces that promote collaboration among scholars of the social implications of computing—including those who are not computer scientists—and the students who work with them.

The working group defined the SCoC’s constituencies to encompass not just MIT students, faculty, and staff who are excited about the broad commitment to ethics and societal challenges but also:

- Employers eager for students with strong critical-thinking skills who have developed reflective practices and intellectual knowledge bridging computing, humanities, and social science.
- Policymakers, regulators, and public interest groups who look to universities, in general, to develop the next stage of computation capabilities and to MIT, in particular, to fill the current gap in policy research, guidance, and leadership.
- Researchers across disciplines, including many of our own students, who are enthusiastic about new areas of research within computing, including questions regarding accountability and explainability that cross disciplines.

Within this framework, the SIRC report describes options for top-down, center-out, and bottom-up actions by the SCoC in its formation and development. The working group believes that such actions could create a durable and malleable structure that strengthens the abilities of MIT community members to analyze and articulate societal and ethical considerations and to pursue cross-disciplinary approaches to developing both policy and technical solutions.

Read the full SIRC report.
ORGANIZATIONAL STRUCTURE (STRUCTURE)—REPORT OVERVIEW

The Structure working group viewed the launch of the SCoC as a critical opportunity to rethink and reorganize how computation is studied, taught, and used as MIT. The group observed many challenges that arise from MIT's current approach and discussed potential new structural configurations that could increase collaboration and remove inefficiencies.

Challenges within MIT's Electrical Engineering and Computer Science (EECS) department include:

- Demand for computing-related courses exceeds the capacity of the EECS department/labs.
- EECS faculty compete over research areas that don’t obviously fit just EE or CS (or fit both).
- Existing lab divisions create artificial boundaries among intersecting research topics.

These challenges are rooted in a binary characterization of faculty as either EE or CS.

The creation and use of computational methods is growing considerably across MIT. Most academic departments are seeking new faculty who make significant use of computing in their research. Envisioning a computing ecosystem that is welcoming and inclusive while promoting methodological focus and the highest scholarly standards was the central objective of the group.

After discussing downsides of the obvious organization for the SCoC (i.e., moving all EECS computer scientists into the SCoC), the group examined a potential alternative structure that includes:

- Four options for faculty interaction with or membership in the SCoC—single-community faculty (SFC), multi-community faculty (MFC), incubator groups, and faculty fellows.
- The creation of a Common Ground for teaching foundational elements of computation supported by a set of new teaching groups that welcome MFC and non-EECS faculty. The teaching groups would represent major sub-topics in computing.
- Three possible approaches to staffing the new Common Ground teaching structure.

The working group also examined three models for how the existing EECS department might connect with the SCoC—as SCF only, as MCF only, or through as SCF/MCF hybrid. Finally, the working group discussed the challenges of implementation, noting that EECS currently is managing a level of administrative complexity similar to the potential new structural models for the SCoC.

Read the full Structure report.
FACULTY APPOINTMENTS (APPOINTMENTS)—REPORT OVERVIEW

With the overarching goals of equity, inclusivity, and appropriate rights and responsibilities, the Appointments working group identified a number of guiding principles for its report:

- Attract truly outstanding faculty at the interface of computing and other areas/disciplines.
- Enrich the involvement of existing MIT faculty presently engaged with computing.
- Recruit, hire, mentor, and promote a diverse and talented faculty with particular attention to historically underrepresented groups in computation.
- Ensure fair treatment for every faculty member hired in connection with the SCoC.
- Prevent “double jeopardy” in faculty hiring, appointments, and promotions when faculty are based in more than one academic department.
- Account for the changeability of what is considered interdisciplinary.
- Eliminate bureaucratic boundaries between disciplinary computer science and multi-community faculty (MCF) while preserving MIT’s excellence in computer science.
- Proceed carefully in establishing a structure for the SCoC so that anything that isn’t working can be changed and that the SCoC can evolve over time.
- Nurture and enhance the excellence of programs and research being conducted in MIT’s existing electrical engineering and computer science disciplines.

The key ideas in the Appointments report include models for five categories of MCF appointments (i.e., dual or joint appointments between departments or appointments in both a department and major lab or institute). Three models are based on existing MIT practices and two represent new ideas generated by the working group. The report also describes an option for hiring “cluster area” faculty as members of interdisciplinary teams that collaborate around a defined theme of inquiry.

Other key ideas include potential guidelines for teaching and service, mentoring of SCoC faculty, and a delineation of rights and responsibilities that could apply to all MCF. These would enable MCF to contribute to the ecosystems of the SCoC and MIT at large. The rights and responsibilities also are intended to encourage academic units to embrace SCoC faculty and provide opportunities for interdisciplinary exchange within non-SCoC departments.

Read the full Appointments report.
CURRICULA AND DEGREES (DEGREES)—REPORT OVERVIEW

The report from the Curricula and Degrees working group examines a number of options that seek to harness the tremendous intellectual energy that the SCoC will bring to MIT—including the potential to substantially alter the Institute’s curricula. Findings are based on two assumptions:

- MIT’s historical model for the administration and conferring of undergraduate degrees by corresponding academic departments will continue for any new degree options.
- Questions related to the administration and conferring of degrees will be revisited after decisions about which academic units are fully or primarily affiliated with the SCoC.

Key ideas for new curriculum development and support include:

- incubator grants for interdisciplinary subjects
- a summer program for first-year students with weak backgrounds in computation
- new introductory offerings in computation
- online education in computation and online modules for programming
- centralized infrastructure and teaching support for computationally intensive subjects
- academic advising

For undergraduate degrees, the working group looked at the strengths and weaknesses of:

- a CS minor, certificate in computation, and undergraduate “threads”
- an undergraduate certificate in computation
- additional 6-N and N-6 degrees, combined 6&N bi-majors, and more NC majors
- a 12- or 18-unit computational GIR

Regarding graduate degrees, the group examined options for:

- a micromaster’s, graduate certificates, and a professional master’s degree in computation
- interdepartmental master’s degrees
- migration of some interdisciplinary PhD programs and new interdisciplinary PhDs

The Curriculum and Degrees report presents thoughts on academic advising for the SCoC as well as a detailed model for a new kind of combined “bi-major” degree.

Read the full Curricula and Degrees report.
COMPUTING INFRASTRUCTURE (INFRASTRUCTURE)—REPORT OVERVIEW

The Infrastructure working group observed broad support for re-examining how computing is supported at the Institute and affirmed that a solid, robustly sustained, and MIT-wide computing infrastructure is needed. The working group examined how the Institute could transform the very culture of equitable access to computing and firmly engage both academic and operational perspectives.

Key gaps identified by the report include:

- The existing imbalance between centralized and decentralized models that results in substantial inefficiencies and inequities.
- A lack of support for data management—a major limitation inherent in research on campus.
- The unsustainability of the current operating model.
- No easily accessible education-focused computing resources.
- A lack of focus on long-term corporate memory and the absence of a plan for renewal.

The primary needs identified by the group in the course of its research include:

- A reexamination of how research computing is deployed across campus and a framework for bringing data to campus and managing it equitably, securely, and responsibly.
- Support for infrastructure that includes appropriate levels of professional staffing, community building, student support, and training support.
- Funding and budgeting mechanisms for a sustainable and renewable model of computing.
- Advancement of environmentally sustainable models of computing.
- Finding ways to improve equitable access to resources across the campus.

In the context of these gaps and needs, the Infrastructure report examines the pros and cons of multiple approaches available for computing infrastructure, including fully centralized, partially centralized but managed within DLCs, fully decentralized, and predominantly cloud-based.

The report also discusses several infrastructure-specific ethical considerations ranging from environmental impacts and privacy-related concerns to open availability and equitable access.

Read the full Infrastructure report.