Guide

SDM Core Integrated Team Project
revised 1 October 2024

OVERVIEW

The integrated **Team Project** is part of a nine-month core on the foundations of systems architecture (SA), systems engineering (SE) and project management (PM). In these projects, teams apply systems thinking and methods on key decisions for the design and implementation of a particular technologically enabled system. These Team Projects run for 4 months, from January to May.

Industry and government organizations are encouraged to pitch a proposal. The proposal should consider a problem rather than an anticipated solution. Not all proposals are selected. Students vote on topics, from which teams of 4 to 5 are formed.

Types of Projects

Projects must involve a technical system to be designed and developed; however, there is flexibility in the type of projects. MIT instructors will work with Partners to refine proposals. Options include:

- Bringing a promising new cutting-edge technology from the lab to market
- Enhancing an existing product by infusing one or more new technologies
- Proposing a next-generation architecture or assessing threats to the dominant design

Projects should be non-trivial and involve a complex ***technical*** system with significant societal, technological, or programmatic challenges. Projects should have a non-obvious answer: projects supporting existing designs with no decision at stake will be less likely to be adopted. Consulting projects, business models, organizational design, process improvement, and portfolio pruning projects are not acceptable proposals.

Pitch and Selection of Projects (December 2024 – January 6, 2025)

Organization hoping to pitch a project topic are asked to submit a 1 pager based on the Pitch Template by December 2. MIT instructors may choose to provide feedback to improve the pitch. Not all topics will be selected for presentation. Selected pitches will be delivered in person* on the MIT Campus on January 6. 2025. Students vote and organize teams that same day. A Gala dinner for students, Partners, and faculty will be held that evening, and results announced by Tue morning, January 7. Typically, half of the topics pitched are selected.

*While online presentation is possible, Partners are highly recommended to present in person that Monday.

Team Project – MIT Presentation Events (May 12 and 13, 2025)

By the end of the semester, each team will deliver; (1) a presentation and (2) an executive memo that summarize their results and recommendations. The presentation from each team will exhibit the framing, design, analysis, and future recommendations for their system including architecture, systems engineering, and project management. A schedule and evaluation criteria for the projects are shown below.

These presentations are the final academic assessment of the teams. Therefore, the sessions will be held in-person only.

Team Project – Partner Final Briefing (May or June 2025)

Since the final project presentations are addressed to MIT's faculty, Partners set up a separate in-depth briefing by students at the conclusion in May or June 2025. This will allow an in-depth debrief between the MIT team and Partners.

Guidance for Partners

The primary role of the Partner is to **provide real-world context, review progress as requested by students, and advise on the relevance of the team's focus -- the "voice of the challenge."**

- Projects are selected, managed, and ultimately delivered by the students; the *students have the prerogative to choose* where to focus, how to evolve, and what to deliver. We ask that Partners remain flexible as students explore, even if their direction diverges from the initial direction set by the Partner.

- In a university, students may choose an unexpected path, make errors, or simply do a mediocre job earning a lower grade. This academic liberty is important to promote ownership and motivated learning.

- Overall, the experience of past Partners has been very positive, including regular interaction with MIT students, insights from different ways of framing the challenge, and access to the latest techniques in SA, SE, and PM. The *team project can stimulate follow-on* industry jobs and Partnered research with a deeper dive and research deliverables.

Expected Sharing of Background Information

If selected as a project following pitches on Jan. 6, Partners are to share background information on the challenge to an MIT shared folder on Dropbox for their student team. The data to be made available to the student team shall be supplied by the Partner, pre-packaged, and available for student team use in a university course setting, by Jan. 7, 2025.

Data can include market projections, landscape of existing solutions, data on a specific problem experience by the Partner, or other which would support the student team coming up to speed quickly and characterizing the problem to be addressed. The shared data will be used by the student team only for assignments in the SDM core course.

As students make progress on the project, they may request additional data of the Partner. Those data that the Partner feels are appropriate and possible to share may be shared directly with the student team or placed in the MIT shared folder.

The *team projects are part of a course, and thus are not sponsored research*. Accordingly, it is not possible to require a contract or agreement (e.g. NDA), a specific deliverable, or tool usage. MIT expects that the contents of the MIT shared data folder will deleted after the conclusion of the semester. The data folders will not be shared across Partners.

Expected Minimum Time Commitment

Partners designate one "mentor" as point of contact within their organization who will provide regular feedback. The mentor will coordinate other internal company resources and data in support of the project.

Each team will coordinate with MIT and Partner mentors for regular dialogue and guidance.

Partners are expected to spend a minimum of 28 hours supporting the project:
- 8 hours to participate and up to 10 minutes to pitch each project on January 6, 2025, and (if selected) initial meetings with students Jan 7-10, 2025.
- 1 hour per week supporting students during the term (16 hours total)

- 4 hours to during final presentations for feedback (May 12-13, 2025)
- 1 hour for Company final briefing (May or June 2025)

Guidance for Student Teams

Students are expected to spend approximately half of their out of class time (5 hours each week) on team project activities.

- Cover context, systems architecture, systems engineering and program management aspects of a system, resulting in in-depth analysis, insights, and executive level recommendations.

- Explain your team's choice to select and apply certain SA, SE, or PM methods and tools.

  - Touch on all three core areas and how the design choices made across SA, SE, and PM relate to one another.

  - Project management content shall not emphasize the team's work during the semester, but rather plans for implementation of the system in future phases.

- Balance experience with new thinking, methods and techniques introduced in the course.

  - Methods may be different from approaches used in specific companies or industries, yet exploration of differentiated approaches is an expectation for this project.

Student Team Coordination with Partners

Set a regular schedule and style for coordination between the Partner and student team. A minimum bi-weekly communication is recommended, as well as 1 or 2 major Partner reviews of intermediate progress during the semester.

There may be tension between assignments and the nature of the challenge or Partner expectations. If these tensions surface, please discuss with TAs and faculty how the assignment might be leveraged to close this gap.

2024-2025 Schedule

Nov 2024	1. Partners submit **draft challenge topics** by Dec. 2, 2024. A 1 pager summary is based on a common format (see PowerPoint slide template and examples). 2. MIT SDM instructors provide feedback for refinement by Dec 15th. Feedback categories are; (a) Accepted & Invited to Pitch in January, (b) Conditional acceptance pending the inclusion of MIT's feedback, (c) Rejected for fit. 3. Students receive a list of topics in Dec., and 1-page summaries at the start of Jan.

Workshop Week
 Jan 6 - 10, 2025
	1/6 (Mon): Integrated Project Showcase
	 • AM: Students present technology posters from assignment OS6 in the fall, exhibiting emerging technologies from across MIT.
	 • PM: Proposals presented* by Partners in 6-min pitches. Students vote on top choices.
	  * in person pitches by Partners are recommended and more likely effective, but arrangement can be made for online pitches.
	  * Gala dinner in evening.
	 Workshop Week Activities:
	 Tue:
	 • Teams formed and kick-off of Integrated Projects
	 • **Initial meetings** with Partners and refinement of project challenges and definitions.
	 • **Design Challenge 3 (DC3)**: Launch Teams, Frame Problem, Establish Charter, Communicate approach to peers and instructor team.
	 Tue – Fri AM:
	 • **Daily workshops** for newly formed student teams
	 Fri PM:
	 • **Teams deliver DC3:** initial framing of problem.

Feb 3 – May 8, 2025	**Spring Term** • Team project work is ongoing through the semester. • "OS" assignments are applied to the team's project topic. • Meetings / check-ins with mentors a few times each month. • TA is assigned to each team for support throughout the semester. **Systems Argument, Plan and Pitch Readiness** • Mid-course reviews on March 31 • Argument drafted by April 29 for rehearsals

May 12 – 13, 2025	**Team Project Final Deliverables**
	 1. An ungraded **poster** to be submitted by May 8 @ 11pm, to allow for printing).
	 2. **Presentation** final version to be submitted by May 11 @ 11pm EDT
	 3. **Executive Memo** to be submitted by May 15 @ 11pm EDT**.**
	
	 • The **final presentations will be grouped into several sessions** of up to 2 hours.
	 • Teams will **deliver 10 to 12-minute presentations followed by a short Q&A**.
	  a. Students are required to attend only the session in which they present.
	  b. Teams will be scheduled to avoid conflict with their other classes.
	  c. Students are encouraged to attend presentations and forums, to view peer team results, to celebrate and to learn from one another.
	 • A **final panel** with the instruction team will be held on May 13 in the afternoon.
	 • A **celebration** will be held at on May 13 12:00 – 16:00.

Team Deliverables

Design Challenge 3 (Jan 7 - 10, 2025)

Design Challenge 3 (DC3) is based on an intense set of workshops over 4 days following the formation of teams for the spring project. DC3 concludes on January 10 with the following deliverables:

1. Submit a validated Charter* and Project Concept for your Team (3 pages or less)
   a. Frames the technical problem, system and project boundaries, potential value, and authorizes the team to plan and proceed.
   b. Focuses on the next 4 months (Jan – May 2025) as the initial phase of a full systems development project.
   c. Includes team roles and teamwork approach including coordination agreement.

Final Deliverables for week of May 12, 2025

- Final project **presentation**: PowerPoint, also submitted to Canvas as PDF, length 10 minutes including Q&A.
- 5-page **executive memo** (submitted to Canvas as PDF) that summarizes results and recommendations. Appendices are acceptable but will not be considered for evaluation.
- A **poster** summarizing the content from the presentation and memo, for the poster session on May 12. The poster session is informal, and the poster is ungraded.

Presentation

- The audience includes SDM instructors, peers and Partner mentors.
- Emphasize problem framing, options, evaluating value, and recommendation options. What is the primary value that it delivers, to whom, and how is the value measured?
- Describe the team's analytic and synthesis strategy. Therefore, what is excluded from the recommendation and why?
- We encourage teams to involve all team members in preparation, and that those who have presented less often in the past be out front. There is no need for all members to present; evaluation will be based on the content and quality of communication.
- At most 3 minutes of pre-recorded video/animation may be included.
- *Any detailed figures (such as those from OS) should be included if a pattern is discernable and tied to a key insight. Detail for detail's sake without a role in the analysis and argument of the project is discouraged.*

Executive Memo

- Audience is the Partner executives, with recognition of other key stakeholders
- The memo is a written argument that leads to a call for action, which frames the problem and guides executives to support the proposal. Relevant deeply held assumptions and conventional biases should be exposed. The memo should be compelling integration of the detailed work completed throughout the semester.

Course Evaluation

As a reminder from the syllabus, the overall grade for EM.413 course consists of:

- 42% Opportunity Sets (2 each for SA, SE, and PM, 7% each)
- 8% OS12 - Integrative Reflection
- 20% Professionalism (Participation, DLOs, Teamwork incl. peer review)
- **30% Team Project Deliverables (Presentation 18%, Executive Memo 12%)**

Evaluation of Team Project Final Deliverables

The Team Project Deliverables will be graded using the following criteria:

System Architecture (20%) Did the team apply relevant analysis and logic to reach conclusions about the architecture? (See next page)

System Engineering (20%) Did the team apply relevant methods from SE to produce a credible recommended system solution? (See next page)

Project Management (20%) Did the team design realistic, optimized, and risk mitigating plan(s) aligned with SA and SE strategy for subsequent stages of the project? (See next page)

Argument and Communication (20%) Does the recommendation follow from evidence-based motivation and problem framing followed by clear arguments? Does the recommendation deliver value to the most important stakeholders? Is the document effective, persuasive and appropriate for a non SDM executive decision maker?

Unique Insights (20%) Does the analysis produce non-obvious, interesting results? (a.k.a nuggets)

Project Evaluation Criteria by Topic

System Architecture	• A representation of the system architecture, including the architectural decisions that the team made and why, and potentially functional or form decomposition if relevant. • An analysis of value delivery and prioritization of stakeholders and / or goals. • A system problem statement and an explicit system boundary. • A description of the broader context in which the system sits, a matched rationale for the rate of architectural change to expect. • An articulation of the competitive strategy to be used in the market with the chosen architecture.
System Engineering	In addition to the problem statement, system boundary and stakeholder analysis above, the project shall clearly demonstrate the follow aspects: • System requirements include traceability from system value and stakeholder needs to subsystem and component requirements. • Systems Engineering methods and tools used – why did you choose them and what methods you considered not to be appropriate for your project. • Different concepts you generated and how you down selected to the preferred system concept. • Verification and Validation strategy • Operations and lifecycle considerations • Final recommendations • Reflection on team learning about systems thinking
Project Management	An approach for implementation of the system (product or service) shall be designed to optimize scope quality, cost, and schedule. Targets (driven by value) and estimates (driven by feasibility) are compared related to scope, cost, and duration. • The expected scope is clearly described, structured at a level of sustainable granularity, related to the system and its value, and measurable. • A project organization approach is selected for a forward-looking implementation of the system. Critical resources and skills are called out. • Choices for structuring and integrating the product system, workflow process, and project organization are highlighted, particularly those choices which are exceptions to standards or conventional wisdom. • The results of design, prototyping, and validation tasks by the project team to date are reflected in an estimate of future implementation activities. • Risks and mitigations are assessed and integrated into the project plan. Uncertain work, re-work, and coordination activities are considered. • Amongst a set of project scenarios, the team proposes a preferred and backup scenarios for system implementation. If meaningful, these options are shown in a tradespace diagram. Concerns from stakeholders are anticipated and addressed.