

Technical Management & System Engineering

We advise both the technical manager and the system engineer to read the entire content of this book to clearly understand their respective role but also the other role.

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Technical Management (TM)

If you don't know what to do as a technical manager, or what the technical manager is supposed to do, please check this page. (You can also just check that you're doing a good job:))

Technical Year Planning

The technical year plan is a crucial deliverable for the team, as it is presented to external stakeholders such as the RvT. The general year plan (done by the management team and the team manager) must include the technical year plan. This plan is rarely perfectly followed until the end of the year, as the work within student teams can be very unpredictable due to dependence on sponsors and the various study loads of part-timers and half-timers. However, the yearly plan should aim to establish some general objectives for the team to have a clear direction throughout the year. It is strongly advised to make more detailed plans during the year (every 10 weeks/module) based on the state of the system and the team at that specific moment. An example of year planning can be found [here](#).

The technical year plan should be created during the TTM (Technical Team Meeting). These meetings are generally joined by team leads to discuss both technical, logistical, communication, and social challenges faced by their respective subteams. Other team leads are encouraged to listen and propose ideas to troubleshoot challenges. The TTM meets regularly (up to the team to decide how often and when). Any plan during the year should be created based on the needs and goals of each subteam. However, it can become very quickly challenging to consider everyone's wishes, and hence, tradeoffs should be found. During the year plan discussion, it is important to ensure that each subteam lead understands why certain things must be planned at a certain time to reduce frustrations.

A good technical manager must be able to think a few weeks ahead by being aware of the weaknesses and the current challenges of the team. The goal is NOT to blame the team, but always to reach out on time and find solutions with the team or work around the problem with them. This means that new versions of the year plan can be created throughout the year.

Sponsors & Contacts

When the team struggles to solve a technical challenge, the technical manager can step in using his knowledge of sponsors and external contacts who could help. Several types of contacts exist:

- **Suppliers/sponsors:** The suppliers/sponsors are listed under the [Product Tree](#). This list includes what Roboteam used from each company during the year 2025-2026. (Please check with your external manager which one of these are sponsors).
- **Service sponsors:** Certain companies, that are willing to sponsor Roboteam, offer a certain monetary contribution and access to certain services:
 - [Demcon](#) generally makes a contract with each student team individually at the beginning of January that includes a certain number of working hours (50 hours in 2026). These hours can be used for teaching sessions but also for consultancy, for development, and for expansion of Roboteam's technical network. Benchmark is a company with a very large variety of expertise fields, from biomedical to military engineering, and hence can also find adequate experts to help us, depending on the needs of Roboteam.
 - [VDL](#) is an important contact for Roboteam as our founder (Rick Timmer) currently works there. Usually, VDL organises a little introduction to technical drawing for all student teams at the beginning of the year. Later on, VDL is sometimes willing to produce certain metallic components for Roboteam. However, the team must provide proper technical drawings to VDL. Rick and his colleagues are generally happy to check, correct and advise on the design of certain components and their technical drawings. VDL is a company with many alumni from the UT and Saxion, and has an important expertise in metal manufacturing.
 - [Benchmark](#) offers multiple services, among which are laser-cutting services and testing infrastructures. They are generally open to discussion and are willing to help us find the most adequate service for the needs of the team.
 - [Mareco](#) has been used in previous generations of Roboteam for 3D printing of challenging materials. The generation of 2023-2024 contacted them to print the omniwheels (contact Chris).
 - [Rosenxt](#) is a company located in Enschede that recently worked on the development of a robotic arm and its end

manipulator. They have a large range of experts, but our year (2025-2026) mainly exchanged with software experts.

- [RAM](#): Research group at the university specialised in fundamental and application-driven topics in the field of robotics. With expertise in control, embedded systems and electronics, RAM is a great source of help for Roboteam when facing unknown or challenging technical challenges.
- **Service infrastructures**: Certain infrastructures from the University of Twente and Hogeschool Saxion can also be of great help for Roboteam. Here is a brief list of these infrastructures:
 - [FAB Lab](#): FAB Lab is a high-tech workspace related to Hogeschool Saxion, and that provides infrastructures for wood laser-cutting, plastic laser-cutting, polymer printing, textiles and sticker printing. The team must simply go to the workspace and inform the staff that they come from a student team. Roboteam has, each year, a certain budget given by Saxion that they can spend in the FAB Lab.
 - [CUBE](#): The CUBE is a building within the University of Twente that is equipped with milling machines, lathes, bending machines, cutting machines, welding infrastructures, laser-cutting and CNC machines. The workshop mainly focuses on metallurgical work and can be used by students who have contacted the CUBE staff (see details on [ing. N.T.M. Spikker \(Norbert\)](#)) to ensure availability of the machines and who have been trained by the CUBE staff to use the machines safely.
 - [DesignLab](#): Similar to FAB Lab, DesignLab is a high-tech workspace within the University of Twente. In addition to the space they offer for events, trainings and workshops, DesignLab is equipped with several FDM 3D printers, wood laser-cutting machines and many more.
 - [Fraunhofer](#): Fraunhofer is a building of the University of Twente that is used mainly for research on additive manufacturing of polymers and metals. The staff of Fraunhofer is generally open to helping student teams with the manufacturing of complex parts as both advisors and manufacturers (Contact [dr.ir. K. Goulas \(Constantinos\)](#) for more information).
- **Advisors**:
 - [dr.ir. S. Arastehfar \(Soheil\)](#): Soheil is one of the three teachers who organise the PD&D minor at the UT. He teaches Design Methodology within the PD&D minor. He has a very large expertise in control and, more generally, robotics. Hence, he is

also regularly supervising minor assignments within Roboteam. He is interested in becoming a regular advisor of Roboteam Twente.

- [dr.ir. K. Goulas \(Constantinos\)](#): Constantinos is one of the three teachers who organise the PD&D minor at the UT. He teaches Materials & Manufacturing within the PD&D minor. His expertise field is material science, and more specifically, additive manufacturing and metallurgy, but he also works with polymers and has many contacts in the field. He also works at Fraunhofer.
- [dr. A. Jalalian \(Athena\)](#): Athena is the PD&D minor coordinator and contact point regarding PD&D and the progress of the students. She generally organises a mid-year check-up session with all PD&D students from Roboteam and their supervisor within the team.
- [ing. N.T.M. Spikker \(Norbert\)](#): Norbert has been the contact point of Roboteam Twente with CUBE during the academic year 2025-2026. The team can ask for advice and a brief training to safely use the machines. Please do not forget to thank Norbert and his team at the end of your collaboration with a cake (be creative).
- [Srikrishna Mantravadi](#): Srikrishna is a system engineer at THALES who contacted Roboteam Twente in September 2025 because he was interested in sharing his robotics knowledge and learn new things. Unfortunately, we didn't manage to make full use of his expertise as the first year we decided to participate in the ERC was very chaotic, but he might be useful in terms of systems engineering and control.

Role & Relation with the team

The technical manager plays a crucial role in maintaining the team balance. It is not expected from him/her to know everything but to be motivated to learn and lead the technical development from a logistical and communication perspective. If the team also has a system engineer, the technical manager (TM) will closely collaborate with the system engineer to ensure that there is a proper overview of the project. The system engineer should be in charge of developing visual tools and the technical manager can be of great help in ensuring that the technical staff makes use of these tools. Additionally, the system engineer will be of great help in the development of planning and the identification of specific challenges.

The TM interacts with the technical team regularly. The TM is responsible for organising TTMs (Technical Team Meetings), a regular meeting (up to the team to choose how often this meeting takes place; it is advised to have one at least once a week) that includes all team leads and the TM. During TTMs, the team leads should give an update on the progress and challenges the colleagues they represent have been working on. Other team leads should be encouraged to listen and propose new ideas/solutions to troubleshoot challenges. The discussion might not always include the TM. However, the TM is expected to listen and chair the meetings. Additionally, he/she can intervene in case an issue requires external contact or if there are matters that require more discussion/better communication within the team. Based on the experiences we had in the year 2025-2026, we would advise organising regular meetings with members from all subteams involved in a specific subsystem (for example, a meeting for the engineers working on the robotic arm every two weeks). Additionally, the technical manager joins the management meetings and offers a perspective from a technical aspects to the management subteam.

The technical manager is also encouraged to establish regular contact with members who are not leads or management. These social interactions can be formally planned or simply casual within the office. These interactions will make it easier for engineers to reach out to the TM, as the TM will look and feel more accessible.

System Engineering(SE)

If you don't know what to do as a system engineer, or what the system engineer is supposed to do, please check this page. (You can also just check that you're doing a good job:))

Diagrams & Visual Communication

The system engineer should be in charge of building the system architecture by identifying and developing the system's interfaces. The engineers who are in charge of developing specific aspects of the subsystems and components of the rover must actively participate in the development of these interfaces and remain aware of them during the development of the project. With the support of the technical manager, the systems engineer is in charge of leading the development of these interfaces, adapting them during the year when subsystems must undergo significant changes with respect to the initial plan, and ensuring that all relevant engineers are aware of the state of the interfaces during the year.

To create efficient and clear discussions/debates between engineers, the system engineer must use visual tools that illustrate clearly the system's current state. A few examples of useful tools are the N2-diagram and the flow diagram. For a deeper understanding of system engineering and its tools, refer to the book [System Design & Engineering](#). Additionally, this [video](#) offers a solid introduction to systems engineering and the foundation of the role of the system engineer. Demcon is a sponsor that is also motivated to help the team develop its system engineering approach if the team feels the need for more guidance.