Board 59: Work in Progress: Industry-based Team Program Reviews for Capstone Design teams

Dr. Rachana Ashok Gupta, North Carolina State University

Dr. Rachana A Gupta is currently a Teaching Associate professor and Associate Director of ECE Senior Design Program. She teaches and mentors several senior design students on industry-sponsored projects (On average 12 / semester) to successful completion of an end product. These projects include all aspects of System Engineering: concept design, product design and design trade-offs, prototyping and testing (circuit design, PCB, mechanical fabrication, algorithm development). These projects have included Robotics Platforms, Planning, Monitoring and Control algorithms, Sensor Interface, User Interfaces, Wireless communication, Signal Processing etc. All of this involves direction and teaching teams how to use the required tools and apply engineering skills to transform a concept into a product. She also manages interdisciplinary senior design projects in collaboration with other engineering departments such as Textiles Engineering, mechanical engineering, etc. Beyond senior design, she has also created and teaches undergraduate as well as graduate-level classes in ECE (Python and scripting, Algorithms in ECE, Practical Engineering Prototyping (PrEP). She also has designed and taught ECE Robotics summer camp since 2012. Dr. Gupta earned her Bachelors of Engineering in Electronics and Telecommunication Engineering from University of Pune, India and received her MS and Ph.D. in Electrical and Computer Engineering from North Carolina State University (2010). Her Ph.D. was to design computer vision algorithms for autonomous navigation for cars. She started her own engineering consulting company in 2010 worked on product development projects such as automated air suspension system for vehicles, active suspension system for heavy-duty off-road vehicles (currently DARPA funded), vision tracking system for race car tracks, etc. She joined NCState as Teaching Assistant Professor in 2012. Dr. Gupta's current research projects focus on sensor systems and engineering design education.

Dr. Gupta likes to tinker with new technology and work on small hobby projects in her basement lab. Her other hobbies include reading, classical dancing, and traveling.

Greg A Dunko Dunko

Greg is the Senior Vice President of the Product and Program Management Office (PMO), where he leads strategic product planning and program business operations. Prior to joining NantHealth, he served as Global Head of Product Development at BlackBerry, leading all mobile phone hardware development. Prior to this, Greg led the Electrical and Computer Engineering senior design program at North Carolina State University – creating a new full year program with emphasis on product development and corporate sponsorship and mentoring. He has also held leadership roles at HTC and Ericsson/Sony Ericsson. Greg is an established inventor and has filed over 80 patents. He also is co-author of the eBook "A Reference Guide to the Internet of Things". Greg holds an BS Electrical Engineering and MS Electrical Engineering from West Virginia University. His graduate research focused on Biomedical Engineering.

Work in Progress: Industry-based Team Program Reviews for Capstone Design teams

Introduction:

Proper project management (PM) is a critical skill that will lead to success in senior design projects as well as in industry [1][5][6]. The reasons for success and failure of projects are well-documented: 57% of projects in the industry fail due to "breakdown in communications"; 39% of them fail due to lack of planning, resources, and activities; and 33% of projects fail because of a lack of involvement from senior management [12]. Just like in industry, we have seen several senior design projects fail due to similar project management related issues. Poor time planning, a dominant team member, one or more team-member not performing, poor communication within the team or with the instructor/sponsor/client/customer, poorly executed project plans (all serial and insufficient parallel activities), and poorly understood critical paths which reduce the time available needed for test and rework are some of these issues, etc.

Capstone design teams are taught various aspects of project planning which fall under "Plan, Monitor, Control, Adjust, and Execute" such as managing scope (what work is to be done?), developing a project time schedule (how long will it take?), evaluating resource and cost (who will do it and how much will it cost?), and evaluating and managing risk and risk responses. Students are also introduced to several PM and communication tools such as Gantt charts, Timesheets, Risk and Accountability Matrices, group chats, Slack, etc. to help them develop and manage their project. There are several methods and tools also available in Engineering Education literature. Some of these are modular PM with a team leader [1], self-regulating PM [2], scrum for software engineering [3], a 2-phase senior design to emphasize the learning of PM [4], peer PM [7] etc. As Lawanto et. al. suggest "there is a benefit in interventions designed to improve self-regulation for specific design strategies employed by engineering students in relation to PM activities."[2]

Students still seem to lack the understanding of several necessary PM aspects even when they receive all the available tools and workshops. These management aspects must be exercised and monitored regularly during the execution phase of the project. Some of these aspects are:

- what is the correct "duration" size of project plan tasks,
- how often should tasks be monitored and the plan reevaluated/adjusted,
- what is managing vs micromanaging,
- what is the best approach to properly evaluate project status at any given point,
- when is it appropriate to ask for help,
- what level of project reporting is appropriate for senior management,
- how best to identify and capture risks vs issues, what risk responses should be established to minimize project risks,
- how to manage team resource challenges like balance to avoid overload, addressing team member incompetency/lack of effort, or managing resource planning on-the-go.

At the same time, instructors may face challenges in defining fair and accurate grading rubrics which will evaluate individual and team performance throughout the execution phase (such as individual team member's technical and management contribution, team's project planning and monitoring skills, individual and team presentation of the material, etc.)

Project management tools such as Gantt chart, risk analysis, critical path, etc. used by authors have been taken from several years of industry and standard project management practices. The

Team Program Reviews (TPRs), suggested and implemented by authors, are comprised of 10-12 minute presentations of specific materials by the senior design team on a biweekly basis. The novelty of this paper is (1) the format, schedule, and the expected contents of the TPR, which automatically enables the teams to consistently monitor, control, adjust and execute the project plan throughout the project execution phase, (2) the TPR template, methods, tools and examples provided to the team by the authors to help them reduce the ambiguity of project management (PM) and help them learn how to apply PM to their team and project outcomes irrespective of the project topic and requirements. These methods also help the teams to regularly report the true status of the project to the project stakeholders, and (3) the rubric model is comprehensive, and helps the instructors to regularly, easily grade every individual and team performance on all important aspects of team projects. This includes a quantitative evaluation of and detailed feedback on intangible aspects (individual and team project monitoring and managing skills, effective teamwork, professionalism, individual technical contributions, presentation skills, etc.) that are difficult to teach/evaluate without in-person team meetings.

In addition, these reviews expose team members to "real world" business practices that they will experience in their engineering/management career. These program reviews have helped the authors successfully and efficiently manage and grade on average 10 to 20 projects per semester in Electrical and Computer Engineering (ECE) Senior Design program at Authors' institute.

Team Program Review High-level rubric:

The high-level TPR rubric is designed to assess three major aspects of any senior design project: (1) Presentation skills, (2) Project planning, management skills, and (3) Technical contributions. TPR format (described in a later section) is designed to assess all three aspects for each member of the team and the team as a whole. Table 1 shows a very high-level rubric and its description and expectations. The detailed rubric is described and presented later in the paper.

Table 1: High-level rubric for Team Program Review

Item & grade	Item description
Presentation/ Conciseness / Effectiveness **30%**	How well are the slides made (in a clear, concise manner with correct formatting.) so that stakeholders not present at the time of the presentation can understand the status quickly by going over them. How well each team member presents the project and the relevant information and answers questions.
Project Planning & management **30%**	How well the schedule and the budget are managed with remaining time, tasks and resources. Are the tasks done in a reasonable time or last minute? Are the task's dependencies, priorities, critical path, issues, risks, delays, and issues managed well and reflected in the task planning? A recovery plan is in place in case of delays task reshuffling and rescheduling?
Technical Contribution **40%**	Individual technical contribution towards the project on a regular basis. All team members have well-thought-out solutions for technical issues and they are resolved in timely manner. Technical achievements are tested and verified against the devised test and verification plan.

Team Program Review Format:

TPR format is deliberately made to force each team to come together every two weeks and follow the method of "Plan, Monitor, Control, Adjust, and Execute." TPR format itself is a tool for the teams to know what to do as part of Project Management.
To facilitate easy management of multiple teams for the instructor and to encourage inter-team information exchange and collaboration, the following rules are used to schedule the TPRs:

1. ***Grouping of the projects:*** All the project teams are categorized into multiple groups based on common technologies, project domains or design similarities. In each group, there are maximum 5 to 6 teams. All teams in a group are expected to be present for their group's TPR session. Such grouping helps teams to learn from each other, suggest technical solutions to each other, help with issues, and in general encourages teams to listen to other presentations. Such grouping also makes TPRs scalable to a large number of projects and maintain a good ratio of the number of project teams to the number of instructors.
2. ***Biweekly schedule and timing:*** TPR sessions for all groups are scheduled every 2-weeks. A 2-week interval has been found optimal for monitoring progress. It is long enough to avoid micro-managing teams, but short enough to catch issues and risks in time to avoid delays. Expected duration of each TPR is not more than 10 to12 minutes.
3. ***Team-member accountability:*** All team members in a team are expected to be present for their TPR. Each team member is expected to present an aspect of the TPR presentation. This helps in improving the overall presentation skills of the whole team and each team member. This also helps in holding each team member accountable for their part in the project, its status, and progress during each TPR.
4. ***Industry presence:*** Various company sponsors and mentors are invited to attend these TPR sessions and to act in the role of "senior management" to questions and to provide feedback to the students based on industry practices, tools, and methods. External sponsors also bring varied experience to the table and provide feedback on the presentation, technical implementations, and project management. For multi-disciplinary teams, it must be made sure that sponsors/mentors from various disciplines should be present for an accurate assessment.
5. ***Presentation summary package:*** A concise TPR presentation should be made available before the review so that stakeholders who may or may not attend the presentation can understand the status by going through the slides.

The above rules for TPR format are designed to fulfill the following industry expectation:

- The TPR is meant to emulate the status reviews that companies typically hold where senior managers are updated on multiple projects. The review contains project management and technical updates.
- Information presented in the review is to be consolidated and concisely presented, with summary icons a.k.a. Project Bottom Line so that the team leaders, project manager or senior managers can focus their attention on the correct items and can take appropriate decisions.
- It is meant to emulate industry based cyclic and regular project planning process of "Plan, Monitor, Control, Adjust, Plan and Execute," to avoid major unexpected risks or delays that can lead to project failures.

Expected contents of a TPR:

The format for the TPRs is designed to highlight the following 7 aspects in 8 slides. The team is given a template (See [13] or Appendix A) with 8 slides for students to follow. A template helps the instructor to easily understand and place the information presented by all teams. It also helps the instructor to highlight the important aspects of the TPR expected from the team.

Table 2 highlights the contents, presentation expectations and the learning outcomes in detail. This is explained in detail in a lecture "How to prepare for a Program Review," before program review sessions begin. In this lecture, all the teams are also provided with and explained in detail, good and bad examples of TPRs from previous years with recordings.

Teams are well prepared for TPRs if they are given the template, a clear definition of expectations, learning outcomes, a detailed rubric, and detailed presentation examples. Information provided in

Table 2 is also very critical when it comes to understanding exactly what needs to happen as part of "Project management" for all the teams. Teams often struggle to understand the exact application and usage of project management tools during the execution phase if they have not received this information through a lecture/workshop in advance.

Table 2: Expected presentation contents of each TPR's 8 slides and associated learning outcomes.

Slide 1. Title (Figure 2: **Appendix A)** **Slide 2. Project Introduction** (Figure 3)
In each TPR, the teams are expected to briefly present the project and its background and need in a way be understandable by any type of audience (not just engineering.) They can use pictures/videos or diagrams on the slide to facilitate the introduction. *The teams are asked to rotate the person who presents the introduction for each review.* The team is expected to assign and justify a color from (green, yellow, red) and place it on the title slide which suggests an overall status of the project (See Table 3).
Learning outcomes of title and project introduction slide: To be able to: ● Present the project clearly and briefly to an audience who may not be familiar with the project or technology. ● Highlight the users' or customer's perspective, need statement and proposed solution. ● Monitor and evaluate current project progress and quickly present it to the senior management for attention to the correct aspects.

Table 3: How to evaluate overall project state and progress.

	Everything is going according to the plan. No major delays or unsolvable issues at this time. A possibility of minor delays but the solution is identified and it's quick and easy to recover from the delay. **No effects on project progress or scope or timeline.**
	Delays due to technical or project issues. Need to adjust tasks to achieve final milestones. Need help from mentors or sponsors. **No change in product requirements. Still be able to achieve everything as planned with minor delays.**

	**Major possibly irrecoverable delays** due to technical and/or project issues. The team ran into unsolvable issues or risks. The team will not be able to achieve demo milestones on time. **We need discussion with mentors or sponsors to re-evaluate the project.**

Slide 3. Project Schedule (Figure 4**)**

Slide includes:

Zoomed in view of Gantt chart or project plan showing tasks and their progress in +/- 2 weeks from today's date (See template on Figure 4.) A clear vertical line marking present date, and the next milestone date, a mark to show % complete in each task with the responsible person's name on it and, a traffic light to indicate the state of the project timeliness. All teams are expected to briefly present the progress of various tasks with respect to present day and upcoming milestone. The respective team member / team manager should identify the tasks behind schedule and address a plan to recover or readjust, resource re-allocations keeping the next milestone and task dependencies in mind.

Expectations and Learning outcomes of project schedule slide:

- Divide project work or bigger task into smaller manageable tasks.
- Plan tasks in parallel if possible and understand task dependencies.
- Clearly define critical path activities.
- Assess and monitor the task progress and present it.
- Adjust the timeline or plan in case of unexpected issues, delays based on the upcoming milestone, dependencies and project critical path.
- Manage/reshuffle roles and responsibilities based on resources and tasks needs.

Slide 4. Accomplishments (Figure 5**)**

Accomplishments are defined as major milestones reached or, breakthroughs achieved as part of project execution. These may be successful functioning of an aspect of the project, completed important checkpoints with respect to completing the product requirements, successful mitigation of an identified risk, something produced for the first time, key events affecting sponsors\mentors\external parties, etc. Accomplishments are ***NOT*** simply "completed necessary tasks." The team is expected to quickly summarize any major accomplishments in last 2 weeks and expected accomplishments in the next 2 weeks with pictures/data or a brief video (15 to 30 sec) to show the accomplishment.

Expectations and Learning outcomes of accomplishment slide:

- Understand the difference between accomplishments and regular project tasks on a project plan to achieve accomplishments. E.g., "Write code for distance measurement" is a task vs "Tested the algorithm for distance measurement successfully for its accuracy. Accuracy = 98.5%." is an accomplishment.
- Understand testing and verification requirement for an accomplishment with respect to product requirements.

- Present achievements/breakthroughs visually and precisely.
- ***Consistently*** make progress on project execution and completion.
- Assess an individual's technical performance on a team and use that information to readjust the responsibilities if needed.

Slide 5. Issues (Figure 6**)**

Issues are defined as an unexpected state or unsettled matter in the present. They include both technical and project management issues and may affect the progress of the project.

Expectations & Learning outcomes of issues slide:

- Recognize the issue (technical or non-technical) in the project.
- Analyze its impact on the project timeline.
- Analyze the cause of the issue and brainstorm possible solutions.
- Describe the issue correctly and concisely.
- Adjust the plan based on the severity of the issue.

Slide 6. Help Needed (Figure 7**)**

The team or respective team member is expected to describe the nature of the help (technical subject matter expertise (SME), supply chain (equipment or resources), planning, managerial, etc.) needed, the person or department or entity from whom the help is needed, and the target date before which the help needs to be received.

Expectations & Learning outcomes of help needed slide:

- Do resource management and recognize limitations within the team and the needed help.
- Research and recognize the entity from whom the help is needed and can be acquired.
- Manage the deadline and timeline so that the help is received in a timely fashion.

Slide 7. Risks (Figure 8**)**

Project risk can be defined as an unforeseen event or activity that can impact the project's progress, result or outcome in a negative way. It arises from "uncertainty." It can be thought of as a project "worry."

Expectations & Learning outcomes of the "Risk" slide:

- Identify the project risks correctly.
- Understand & analyze the severity of the risk based on the likelihood of its occurrence and its impact.
- Devise the correct response (Mitigate, Avoid, Transfer, and Accept) to the risk based on its impact and project requirements and justify it.
- Monitor the risk regularly and resolve risks.
- Briefly explain the identified risks and response keeping the project requirements and planning in mind.

Slide 8. Action Items and Summary (Figure 9**)**

Action items are defined as tasks recognized by the team members as ad-hoc tasks or assigned by sponsors/mentors/instructors which are different than already scheduled tasks on the project Gantt chart as part of completing the project.
The team is expected to summarize the project progress and review the necessary action items & target completion date and responsible person. The reviewer/instructor/manager can provide feedback and suggest action items based on the previous slides.

Learning outcomes of action items and summary slide:

- Maintain action items list and their priority so that small ad-hoc tasks do not go unattended.
- Assign the correct person for the action items by managing project roles.
- Understand the target date for the action items with respect to the upcoming project tasks/milestones.

The sequence of the slides is proposed to facilitate a logical flow from project tasks schedule to summary. Very rarely teams are allowed to change the sequence if they believe that the flow of the presentation will be improved.

Detailed TPR rubric and grading mechanism:

The ***Table 4*** explains the detailed rubric and breakdown of every TPR aspect under the three categories of Presentation, Project management, and Technical contribution as described in the main rubric (Table 1.)

Table 4: Detailed rubric model for TPR content and main learning outcomes in mind

TPR Content	Grading percentage in each category			Total
	Presentation	Project Management	Technical contribution	
Project introduction	10			10
Project Schedule	5	10	5	20
Issues & Help needed	5	5	20	30
Accomplishments	5	5	15	25
Risk Update	5	5		10
Action items		5		5
High-level rubric	30	30	40	100

The format and the breakdown of the rubric gives flexibility to the instructor. The instructor or mentor can calibrate the rubric model based on various aspects of project management that are emphasized throughout the project execution phase. This breakdown also helps the instructors (as reviewers) to easily provide timely and detailed feedback to each team after each review. The grading table above is used to create a grading/feedback sheet for every team member (see [14]). Each cell has space to post feedback and the grade based on the team's TPR.

The current methods used to post feedback is to have the grades/feedback table (Table 4) as a Google Sheets for each TPR in each team's TPR folder. It is easy to post feedback in each cell using Google Sheet comment feature. Only the recipient team member or the team is given access to their grading/feedback sheet at the end of their TPR. Google sheet comments automatically are emailed to the team after the instructor posts the feedback making it easy for the instructor to post the feedback and the grade immediately after each team's TPR.

The percentages and breakdowns in the table above are found suitable for Electrical and Computer Engineering senior design projects where each team member is expected to have a project management role as well as a technical role in the project. However, the design of the model is simple and easy to customize based on any discipline and expectations from team projects. The same model can also be used for multi-disciplinary teams as these project management principles are to be followed and assessed irrespective of the discipline for any design and development project. For multi-disciplinary teams, it must be made sure that sponsors/mentors/experts from various applicable disciplines should be present / invited for the teams' TPR for an accurate assessment and valuable technical feedback.

Performance assessment and industry interpretation:

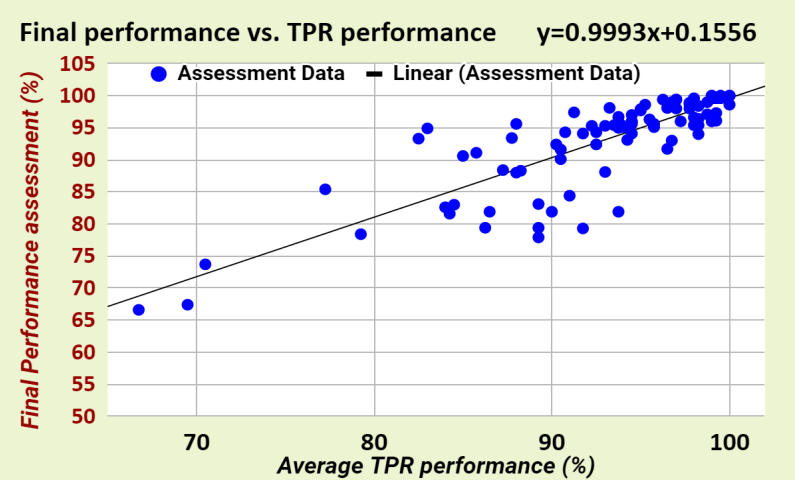


Figure 1: Final performance assessment vs average TPR performance throughout the execution phase. A linear regression was performed on the data to find the correlation coefficient.

Figure 1 shows a graph of overall assessment of team's project success versus their average grade of total 4 TPRs during the execution phase of the project (blue dots). The final performance assessment was done by 20 representatives from industry and 10 ECE professors as external performance evaluators. These include team's clients, sponsors, mentors and Design Day judges (for final project demonstration). Performance evaluators assessed (1) final product design, (2) project performance and completion with respect to product requirements, (3) technical difficulty and understanding, (4) perceived teamwork, (5) each team member's contribution, and (5) presentation quality. Instructor included other aspects in assessing the final performance such as (1) initial design quality of the product and design reviews, (2) milestone demonstrations such as product beta demo, dry runs, and (3) team's overall participation in class. *Note: The TPR grade was deliberately excluded from the calculation of final performance assessment to impartially evaluate the correlation. The scores are absolute (out of 100) and were not scaled or curved based on the lowest or the highest scores.*

The data presented in the graph was gathered during 2018 from 24 teams comprised of 98 students. It is evident from the graph that the final success of the project is highly correlated to team's performance throughout the execution phase. ***With a linear regression fit, the correlation coefficient was found to be 0.9993 ~ 1 (See the graph for equation).*** The overall interpretation

of the final assessment score by external evaluators are explained in Table 5. It shows that majority of the teams achieved very good to excellent performance according to the external evaluators. Authors believe such performance was made possible due to habits created through regular TPRs during the execution phase.

Table 5: Final scores and their interpretations by external performance evaluators

% Scores	Interpretation with respect to industry expectations	% of teams in this category
Below 70	Very poor performance	2
Between 70 and 80	Average performance	6
Between 80 and 90	Good performance	13
Between 90 and 100	Very good to Excellent performance	79

Conclusion:

As described earlier, every successful project incorporates project planning, monitoring, controlling, adjusting, and execution. Teams that utilize deliberate reviews, supported by a specific format and defined expectations, have greater success in achieving successful project completion. The TPR format, schedule and content forces teams to sit together to ***plan*** and ***monitor*** as well as ***adjust*** their plan on regular basis keeping future milestones in mind, a key aspect of successful project management.

Historically, many teams have also lacked the knowledge of how to manage accountability in a team. Bi-weekly TPRs help them hold each team member accountable for their part of the project and still be involved in overall project management as a team.

Students often underestimate "consistent" progress on project execution and related technical tasks. Without TPRs, team members may get into a habit of waiting until the last minute (before any major deadline) to make significant progress on the project's functionality. By including *Accomplishments, Issues, and Help needed* in the TPR, each team is forced to evaluate their technical progress on a regular basis (every two weeks.) This also forces each team to define and review their test and verification plan for each accomplishment against product requirements.

In addition to improving success on their senior design projects, these TPRs prepare students for what is expected of team projects in an industry setting. They also prepare the team on techniques and practices for correctly and precisely updating the project stakeholders regularly. There are several key aspects of successful project management, which often go unlearned/unpracticed/ unapplied in senior design projects. These aspects are brought forth by these TPRs. A template and detailed rubrics help teams understand the emphasis on various non-technical, but important, aspects of a team project, so they can prepare for them and apply them to their projects. Most importantly, the clear format, scheduling, template, and rubric help the instructor to easily, efficiently, and regularly grade each individual and the entire team on their presentation, project management, and technical contribution. The resulting projects are successful. These methods, tools, and rubrics are scalable to a variety of project topics as well as a large number of teams.

References:

[1] Rutar, T., & MS, B. S. (2011, June), *A Modular Project Management Approach to Undergraduate Senior Design Projects* Paper presented at the 2011 ASEE Annual Conference & Exposition, Vancouver, BC. https://peer.asee.org/17350

[2] Lawanto, O., & Cromwell, M., & Febrian, A. (2016, June), *Student's Self-Regulation in Managing Their Capstone Senior Design Projects* Paper presented at 2016 ASEE Annual Conference & Exposition, New Orleans, Louisiana.

[3] Chen, Z. (2017, June), *Applying Scrum to Manage a Senior Capstone Project* Paper presented at 2017 ASEE Annual Conference & Exposition, Columbus, Ohio. https://peer.asee.org/27605

[4] Porter, J., & Wright, G., & Morgan, J. (2005, June), *Managing Senior Design Projects To Maximize Success: The Tat Team* Paper presented at 2005 Annual Conference, Portland, Oregon. https://peer.asee.org/15336

[5] Porter, J., & Zoghi, B., & Morgan, J. (2002, June), *Integrating Project Management Into The Capstone Senior Design Course* Paper presented at the 2002 Annual Conference, Montreal, Canada. https://peer.asee.org/10441

[6] Vavreck, A. (2002, June), *Project Management Applied To Student Design Projects* Paper presented at 2002 Annual Conference, Montreal, Canada. https://peer.asee.org/10315

[7] Watkins, G. K. (2018, June), *Peer Project Management for Capstone Design Teams* Paper presented at 2018 ASEE Annual Conference & Exposition, Salt Lake City, Utah. https://peer.asee.org/30865

[8] Jack, H. (2010, June), A Risk Assessment Tool For Managing Student Design Projects Paper presented at 2010 Annual Conference & Exposition, Louisville, Kentucky. https://peer.asee.org/15672

[9] DeBartolo, E. A., & Robison, W. L. (2018, June), Board 86: Risk Management and Ethics in Capstone Design Paper presented at 2018 ASEE Annual Conference & Exposition, Salt Lake City, Utah. https://peer.asee.org/30123

[10] Hoffman, T., & Zappe, C., & Shooter, S., & O'Donnell, M. (2002, June), A Study Of Risk Communication In Engineering And Management Curricula Paper presented at 2002 Annual Conference, Montreal, Canada. https://peer.asee.org/10270

[11] Robertson, J., & Tidwell, J., & Thomas, R., & Charlton, W. (2008, June), Risk Management – Are Engineers The Problem Or The Solution? Paper presented at 2008 Annual Conference & Exposition, Pittsburgh, Pennsylvania. https://peer.asee.org/3683

[12] Busse R., Henze T., "Case Study: Re-Visiting the Roles of Project Management Maturity and Organisational Culture for Perceived Performance – A Replication Based on German Data," Advances in management, Vol. 11, No. 4, Dec 2018

[13] Team Program Review Template, https://docs.google.com/presentation/d/1jAnMO5cA251kCWWQCFJNiuYS9NlYU_VZ3U-LKS0bv2Q/edit?usp=sharing

[14] TPR grading sheet, https://docs.google.com/presentation/d/1P0Ya2nqUwSKfNNCTsPiaJgOmtbm6fd_FxCeQABDIEhQ/edit?usp=sharing

Appendix A TPR Template slides

Figure 2: Slide 1: Title slide template

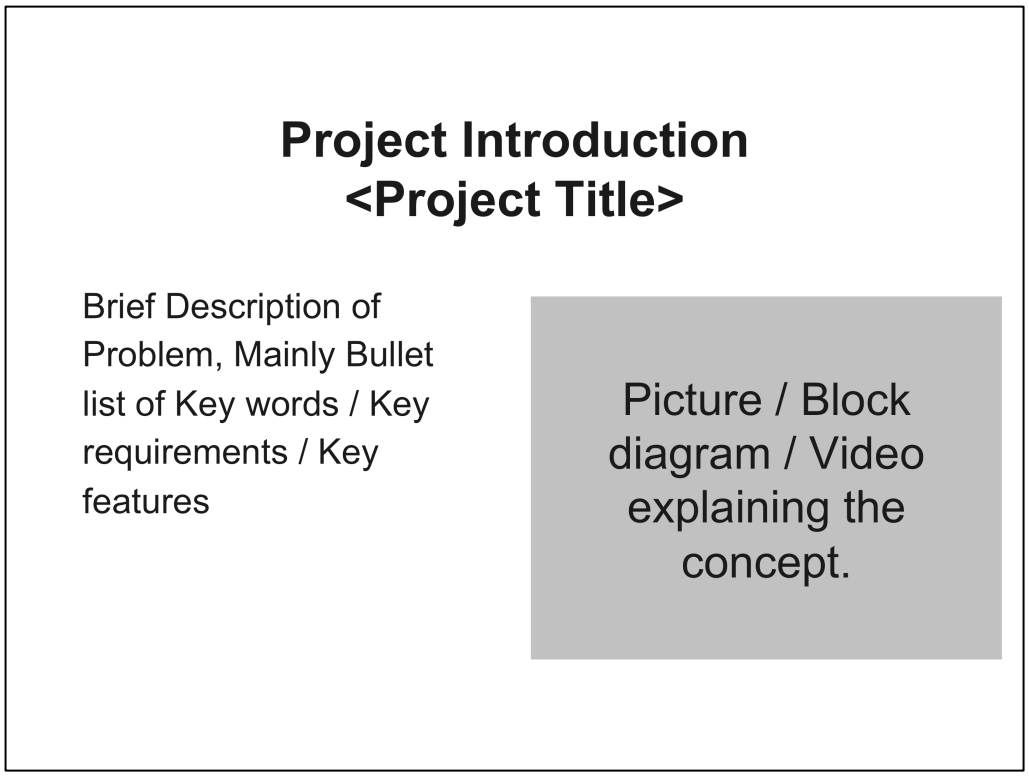


Figure 3: Slide 2: Project Introduction slide template

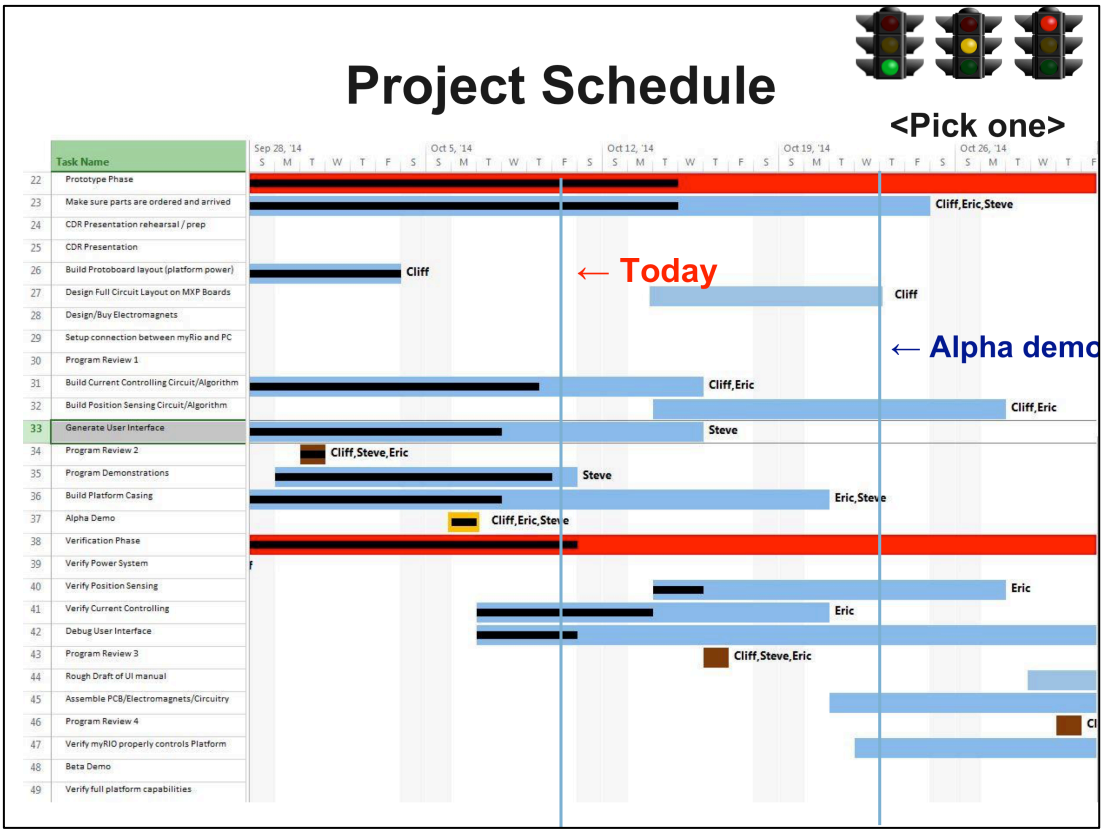


Figure 4: Slide 3: Project Schedule slide template

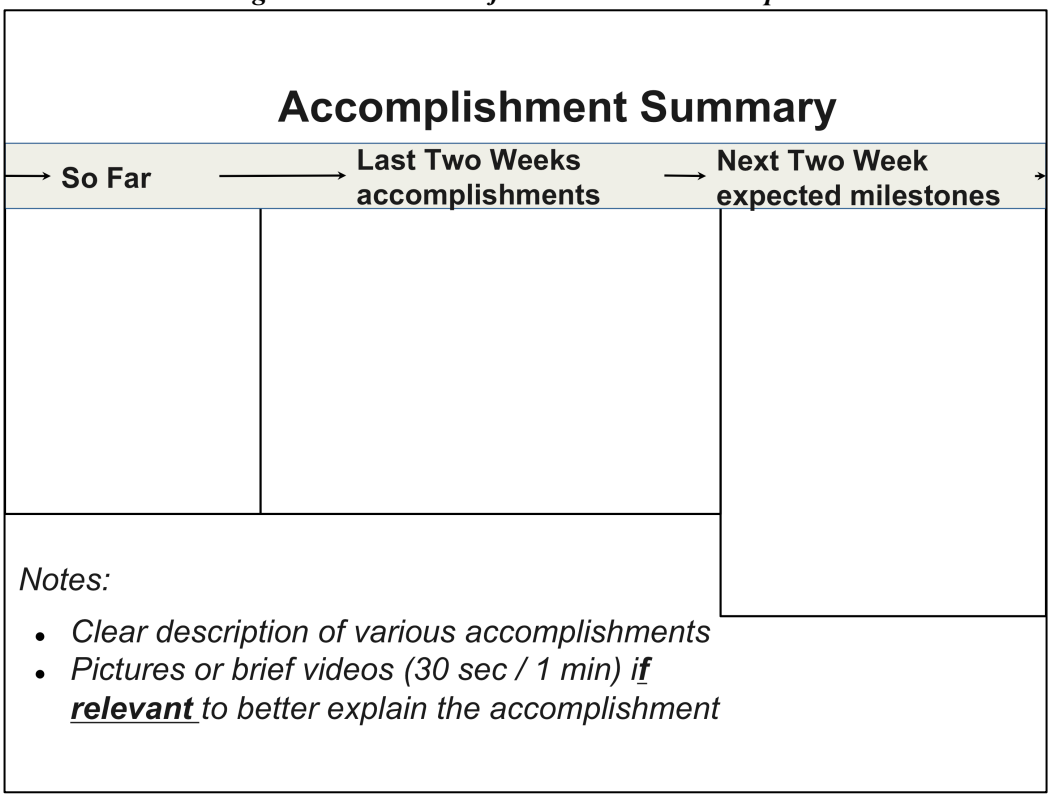
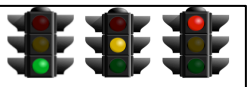


Figure 5: Slide 4: Accomplishments slide template



<Pick one>

Issues

- Issue 1
  - Potential Solution
- Issue 2
  - Potential Solution

Figure 6: Slide 5: Issues slide template

No traffic light

Help Needed

- Help needed in
  - target date / information / related task
- Help from instructors
- Help from TAs
- Help from mentors / senior management

Figure 7: Slide 6: Help Needed slide template

<Pick one>

Risk Update

Risk ID	Description	Category	Response	Status
Unique ID			Mitigate: <How to mitigate>	Open
			Transfer: <To whom and how >	Closed
			Accept: <Impact>	Monitor

Color coding: Yellow: medium impact risk, orange: Medium to high, Red: High and Green: very low impact

Figure 8: Slide 7: Risk Update slide template

No traffic light

Action Items & Summary

Target Date + Action ID	Description of the action item (person responsible)	Status
		Open
		Closed
		Closed

Remember: Action items are not the scheduled projects tasks. Project tasks should be on your project Gantt chart and not here.

Figure 9: Slide 8: Action Items and Summary slide template