



Guidelines for Project Activity Surrounding:

Who to contact in the Collaboratory

Charter Reviews

Project Reviews

Individual Performance Reviews

Project Reports

Project Records

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Who to contact in the Collaboratory

Doug Flemmens, Director

- Connections between Collab and broader Messiah College campus/structure
- Connections between Collab and community outside of Messiah
- Fundraising and giving to the Collab (not related to site teams)
- Concerns about any Collab staff or overall program
- Exploring and vetting new project ideas

Dereck Plante, Engineering Projects Manager

- Engineering Project Support including the following:
 - Hiring process/staffing a project
 - Partner communications (can attend meetings or assist if partner is unresponsive)
 - Deadline or technical issues as well as conflict resolution
 - Arranging meetings with Messiah staff
 - Unusual project activity that requires special permission or use of facility outside of Frey
 - Coordinating/connecting with external professional consultants/Project Review panelists
 - Exploring and vetting new project ideas

Lori Zimmerman, Program Manager

- Overall health of Collab program and its projects
- Project Review scheduling, tech and room set up
- Site team training
- Project Support for non-engineering projects and teams
 - Hiring process/staffing a project
 - Partner communications (can attend meetings or assist if partner is unresponsive)
 - Conflict resolution
 - Arranging meetings with or communicating with Messiah staff/offices

Project Manager

- All specific questions and subjects related to project work

Shannon Walker, Administrative Assistant and Logistics Coordinator

- Project finances/balances/petty cash
- Reserving Frey 353 Conference room
- Site team logistics
- Ordering supplies for non-engineering projects

Erin Brenneman, Student Director

- General questions/comments/concerns about Collab
- How to get involved
- Information on Discipleship Community
- Student leadership opportunities and support

Charter Review

A Guideline for a Charter Review Meeting

Definition

A Charter Review is a brief meeting with the team, Collaboratory staff, and key faculty regarding the overall mission and vision of the project. The meeting is intended to align all team members and support personnel on a common direction and vision for project activity. The meeting should provide opportunity for the team to demonstrate a clear understanding of their charter and to briefly solicit feedback and to solidify any aspects of the project charter that were previously unclear.

Preparing for the Charter Review

1. An essential first step in preparing for a charter review is completing the project charter. The Collaboratory provides a template for project charters that will guide the team through essential elements in framing a successful project.
2. The preparation for the charter review meeting should not take more than a few minutes of the team's time.
3. Each team member should read and be familiar with the charter and be ready to answer questions about their plan/charter. All IPC team members should attend and be prepared to answer any of the 6 questions listed below.

Format for the Charter Review Meeting

The charter review meeting will be scheduled for 15 minutes therefore please arrive to meeting 5 minutes early. The team should prepare using the following suggestions:

1. The team may come to the meeting with PowerPoint slide/s that includes a map or a photo or some other item (they want to use for reference) that helps them answer a question about the charter. However, the team should not come to the meeting with a prepared presentation. Please have a USB thumb drive with necessary files.
2. The team and PM/Collab staff/grader will sit around a table for an informal question and answer time.
3. The panel may ask any of the following questions of any team member, so each should be prepared to respond:
 - a. Why is your project needed? What is the need of your partner?
 - b. How does your team plan to invest in itself relationally and spiritually this year?
 - c. How does your team plan to invest in its partner relationally and spiritually this year?
 - d. In just a few sentences, what is your long-term physical deliverable?
 - e. What are the main highlights of your projected work timeline for the upcoming school year? (What are the main goals/tasks?)
 - f. Talk about your project budget for the current school year in general. (For example, is there a need for a large sum that you don't know where it is coming from, or do your current funds cover what you need, etc.?). Teams will only be given funds for the difference between their expected expenses and current balance provided they provided sufficient detail on what their expenses will be for the coming year.

Overview of Project Management Process

An Overview of Work Cycles and their relation to the Academic Calendar

Definition

The **Project Management Process of the Collaboratory** is designed to help teams maintain clear direction and productivity within the context of the academic calendar. In summary, each semester will contain two project work cycles, roughly dividing the semester into two halves. During each work cycle, teams are expected to (at the beginning of the cycle) identify specific goals for the work cycle and (at the end of the cycle) summarize their progress towards these goals as well as submit any project documents appropriate at that time. In addition to these activities, the team will conduct a more formal Project Review one time per semester, near the end of one of the two work cycles. Collaboratory staff will help in the logistics of this process, scheduling project reviews for all teams, helping to create panels for these reviews and triggering key documents at the beginning and end of each work cycle. Most of this communication will come from the Collaboratory Programs email address. (Collabprograms@messiah.edu.) It is important that Project Managers and Student Project Managers pay close attention to the content of these emails.

Planning at the Start of the Project Work Cycle

1. At the beginning of the academic year, all teams should complete a Planning form no later than September 12, 2019.
2. After each work cycle, a Planning form should be filled out no later than 2 weeks after the work cycle has ended.

Closing the Work Cycle

1. Submit, as triggered by email from collabprograms email address:
 - Submission Form
 - Report and Records included in this form
2. Begin developing your preliminary, high-level goals for the next work cycle. Share these at the Project Review if one is scheduled this cycle.
3. If appropriate, prepare each project team member for the Project Review meeting. The Collaboratory will prepare a project summary sheet for the review panel.
4. Your Project Manager and/or grader will upload review comments for project report and records via the “Project Report and Records (First Draft Comments)” form.
1. *After* receiving review comments, the team has one week to resubmit documents, if required or desired, via the “Project Report and Records (Final Submission)” form.
 - a. Deadlines for the Final Edited Records and Reports are due by 5pm on the following Friday.
2. On the Monday after the end of the work cycle or Project Review, the team will receive an email from Collabprograms@messiah.edu that contains a link to their next planning form.
 - a. Deadline for the planning form to be submitted to the Project Manager is within 2 weeks of the completion of the work cycle.

Project Review Guidelines

A Guideline for Project Review Planning

Definition

A **Project Review Meeting** provides an opportunity for the team to present the overall purpose of the project with particular focus on recent activities towards achieving that purpose. The presentation shall anticipate, invite and encourage dialogue with a review panel. Effective Project Review meetings will leave the reviewers with an accurate perception of the project's status and the team with helpful input from the reviewers towards achieving their goals. Project Review meetings also provide an opportunity for the Collaboratory Staff to check in on the status and health of a project team.

Scheduling Project Reviews for the 2019-2020 Academic Year for Engineering Teams

	A	B	C	D	E
	MPWD, WFW, EMMS, VWOS, Land Development, Sustainable Mobility	Prosthetic Knee, Gravity Fed, Nepal Wheelchair, Clubfoot Brace, Panama Bridge, Pico Hydro	MAP, Solar Oven, IWP, ROCK, HTL, Solar PV	DVD, Landmine, Sustainable Agriculture, FTMS, CCA Civil, Better Pumps	Falcon UAV, Block Press, FAD
Feb					
3	M	First Class Day			
4	T				
6	R				
11	T				
13	R				
18	T				
20	R				
25	T				
27	R				
Mar					
3	T	get submission form email	get submission form email	get submission form email	get submission form email
5	R				
6	F	Symposium initiation deadline			
10	T	Initial Doc Submission	Initial Doc Submission	Initial Doc Submission	Initial Doc Submission
		Peer Evaluations Begin (through 3/12)			
12	R	get submission form email			
13	F	Project Review	"End-of-Cycle"	"End-of-Cycle"	"End-of-Cycle"
17	T	Spring Break			
19	R	Spring Break			
24	T	get planning form email	Initial Doc Submission	get planning form email	get planning form email
26	R	Planning Form Due	Planning Form Due	Planning Form Due	Planning Form Due
27	F	Final Doc Submission	Project Review	Final Doc Submission	Final Doc Submission
		Symposium author information deadline			
31	T	get planning form email			
Apr					
2	R	Planning Form Due			
3	F	Final Doc Submission			
7	T		get submission form email		
		Symposium title/abstract deadline			
9	R				
10	F	Easter Break			
13	M	Easter Break			
14	T		Initial Doc Submission	get submission form email	get submission form email
		Symposium Common Session - Poster Presenters			
16	R	Service Day			
17	F		Project Review		
21	T	get submission form email	get submission form email	Initial Doc Submission	Initial Doc Submission
		Symposium Common Session - Oral Presenters			
23	R	Symposium Poster Presentations: first draft of poster due to Project Manager			
24	F		Project Review		
27	M	Symposium Poster Presentations: final poster due; Project Manager submit to Dr. Van Dyke by 5:00 p.m.			
28	T	Initial Doc Submission	Initial Doc Submission		Project Review
30	R	"End-of-Cycle"	"End-of-Cycle"		
		Symposium Oral Presentations: PPT file due by 5:00 p.m.			
May					
1	F	Symposium Event			
5	T	final class period and grading due of first submission	final class period and grading due of first submission	final class period	final class period
8	F	final exam period 10:30-12:30			
11	M	Final Doc Submission	Final Doc Submission	Final Doc Submission	Final Doc Submission
15	F	Project Grading Complete by 8:00 a.m.; Grading Summit			

Facilitating the Project Review Meeting – Recommended Outline

Project Review meetings are often most fruitful when there is open multi-directional dialogue. There may be components of the meeting that are presentation-based, but those times should be minimized and interspersed with opportunities for discussion and feedback. In general, the team should be inviting feedback on their work and inviting assistance and/or advice on any current challenges they are encountering.

Project reviews will consist of three primary components – project update, take-aways, and meeting evaluation.

Part 1 - Project Update

5 minutes – Introduction (this should include overall context of the project) followed by ~50 minutes – Facilitated Discussion/Review. The team should be prepared to manage the 50 minutes well to ensure that the most important topics receive appropriate time for discussion. (This will typically mean having about 20 minutes of “uninterrupted” content. See detailed “Guideline for Discussion/Facilitated Review” section below.

Part 2 - Take-aways

10-15 minutes. The team should capture, organize and clarify key pieces of feedback received during the Project Update discussion. See detailed “Guideline for Take-aways” section below.

Part 3 - Meeting Evaluation

~10 minutes. In this part, the team needs to “change gears” and step out of the actual project discussion into a time of inviting feedback on how they have facilitated the actual project review meeting itself. This will require an intentional changing of focus from the project work to focusing on the how the team has handled the previous 70 or 75-minute meeting. Additional guidance and leading questions for this part of the review will be provided by the Collaboratory. If the take-aways part of the meeting is wrap-up and closure, this part of the meeting would be considered as looking back at the meeting and evaluating “how did it go?”

Guideline for Introduction

Project Team Responsibility

A member(s) from the project team gives a short overview of the project (3-4 minutes):

- Welcome everyone and give opportunity for introduction of those around the table.
- Briefly, state names and area of study for each member on the team.
- Explain the need this project will meet and describe the relevant stakeholders.
- Briefly describe how team invests in itself—relationally and spiritually.
- Who is your partner? How frequently and to what degree are you in contact with them?
How has the team invested in the partner?
 - If applicable, show a geographic representation of where the project is focusing.
- Explain the high level “global” timeline for project and approximately how the work of the current review cycle fits into the big picture.
- Clearly outline goals specific to this work cycle.

Guideline for Discussion/Facilitated Review

The project team should lead a discussion focused on progress towards goals of the work cycle. Portions of the discussion could be direct presentation, but the one-directional presentation time should be limited to 20 minutes (in other words, a presentation prepared assuming zero discussion would take no more than 20 minutes so that there is time remaining for discussion to take place at the Project Review meeting within the 50 minute timeframe.)

Management of that time will require intentional prioritization. It may not be necessary to share details related to all work done during the work cycle. Instead, focus on key activities and on items for which the team most needs feedback from the review panel. It is helpful to prepare questions in advance of the review in areas where the team is most in need of support from the review panel.

Everyone on the team is responsible for the quality of the facilitated review, but not everyone needs to have a formal presentation or speaking role. Throughout an academic year all team members should have a speaking role in the Project Review setting at least once.

If the partner is present, gratefully acknowledge their role in the project and adjust your meeting plan to incorporate them, perhaps asking them to reaffirm your understanding of the need and specifications for your project and requesting specific feedback about the proposed solution to meet that need.

Guideline for Take-aways

Prepare to create the list of take-aways during (vs. “after”) the review phase of the meeting. The recommended method for doing this is to designate a portion of the white board for this purpose and have someone (who has both a good ear and clear handwriting) capture key points during the discussion. Then, during the take-aways portion of the meeting, the team should work with the panel to clarify these points, ensuring there is clear understanding of each point. Use clarifying statements such as “What we heard you say was...” and “We believe you are recommending that we...” If possible, as time allows, the team should start the process of prioritizing these items as well as starting to determine appropriate action items or next steps associated with each item. It is likely that this process will need to continue at the next team meeting, however, at minimum, the team should leave the project review with a clearly understood “list of things to address.” This take-aways part of the process could be considered the meeting wrap-up closure process and is appropriate to do for most types of business meetings.

Guideline for Meeting Evaluation

Part of the purpose of doing these reviews is to improve your public presentation/meeting facilitation skills. The final 10 minutes of the presentation time slot should be dedicated to looking back on the meeting and asking, “How did we do?” This will require an intentional changing of focus, away from the project work itself, to focusing on the how the team has handled the previous 70-minute meeting. Practice a clear transitional statement to start this part of the discussion. An example would be “This concludes our project review for today. Thank you for your feedback on our project work. While we are together, we would also love to have your feedback on our presentation itself. Was our presentation clear? Was it well organized? In what ways could we make our presentation clearer,

more interesting or more productive?” You may even want to start a new list on the whiteboard titled “Presentation feedback.” Your goal for this time should be to get as much feedback from as many members of the audience as you can. Quickly clarify input if needed but don’t dwell on one point more than necessary. If feedback is negative, don’t be defensive. If feedback is positive, be humble and note that you will try to keep that aspect of the presentation. Be thankful for everything. Continue the atmosphere of “inviting feedback” until you either run out of time or the panelists seem to have concluded. At the designated end time, thank those who have participated. Make yourself available for additional conversation as appropriate but try to do this outside of the meeting room so the next team can set up or the room can be returned to class format.

Project Review Tips

1. Edit your PowerPoint for proper grammar and content relevant to the Project Review presentation.
2. Wear professional or business casual dress, and treat the Project Review presentation as a business event. The Project Review panel consists of faculty and other industry or professional representatives.
3. Practice transitions to make them flow smoothly and quickly.
4. Ensure the font and font sizes are legible on the PowerPoint. There is a template Collaboratory PowerPoint available on Collab Internal.
5. If you have detailed calculations and charts in your project records that are important in your presentation, print them as a handout so your reviewers can look at them during the presentation. Feel free to refer to these handouts, but do not go through each of them in detail. If you receive a question, then you can use the handout to talk more specifically regarding your response.
6. Invite your Project Manager to help refine your Project Review planning, perhaps even hosting a mock meeting in advance so that you are better prepared for the session.

Project Review Preparation Checklist

The following list of items is provided to help teams prepare for a strong Project Review meeting. The review panelists will be expecting to see each of these addressed:

Preparation

Project Review Submission	Be sure to prepare the Submission form on time, no less than three business days prior to the Project Review meeting.
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Communicate Well	Correspondence with the Collaboratory office, project managers, and Project Reviewers should be professional and respectful.
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Presentation and Discussion

Audience Awareness	Demonstrate an understanding of your audience, speaking to them respectfully and valuing their time. Dress professionally and speak clearly.
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Evidence	Show evidence of the work that the team has accomplished. This can include such things as photos, drawings, or physical prototypes. Oftentimes the evidence will be documented within a project record.
Project Story	Be prepared to tell the overall ‘story’ of the project, particularly if there are guests present who know little about the project. Be sure to include a clear definition of the problem to be solved and describe the various stakeholders.
Organization	Organize the presentation/discussion time in a way that is intuitive and flows well, but also highlights and gives appropriate time to priority items and topics requiring discussion.
Foster Dialogue	The best Project Reviews come about when the team facilitates discussion with the review panel, asking good questions and responding respectfully to feedback.

Evidence of Planning

Goals – Clarity	Clearly articulate the goals that had been established for the work cycle.
Goals – Difficulty	Demonstrate that the goals set were an appropriate level of challenge. In the event that you began work and realized the goals were either too challenging or too trivial, how did you respond?
Goals – Deliverables	Demonstrate that the deliverables for the work cycle, including project records, were well planned and developed over the course of the cycle, not all thrown together on the last day.
Goals – Alignment	Demonstrate that the goals for the work cycle were well aligned with the overall project goals. In instances where project scope creep started to occur, explain how you adjusted and maintained a healthy trajectory.
Goals – Looking Ahead	Be prepared to share preliminary goals for the next work cycle with the review panel. In particular, it will be important to make sure that what you perceive to be highest priority moving forward aligns with the panel’s thinking on priorities.

Evidence of Progress

Goals - Project Review	Document and explain progress made towards the goals of the current review cycle and offer clarification on goals not achieved.
Documentation	The project report should be updated and the project records should be complete and professional (see separate guidelines documents for each of these).
Global Timeline	Demonstrate that the team is on track for on-time delivery of long-term goals. In the event that the team is not on track, acknowledge that and develop an adjusted timeline and plan.

Team Health

Partner Relationship	Clarify the roles of any partners or clients involved in the project and indicate whether they are appropriately involved in your work.
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Efficiency	Demonstrate that the team is working efficiently and that the hours expended on the project are proving fruitful.
Commitment	Demonstrate the team's commitment to overall project success. This could be in the form of hours worked or heart-felt passion for the project and target community.
Expertise	Demonstrate that the necessary expertise for success is present on the current team. In the event that other expertise is needed, clearly articulate that.

Individual Performance Assessment

Strong team performance relies heavily on meaningful contributions from each team member. The Collaboratory project management framework aims to provide formative feedback to individuals so that they can learn how to become stronger team members. The framework also provides accountability so that those underperforming are identified.

Individual performance is addressed via two different venues: 1. Performance Assessment Meetings, and 2. Performance Assessment Surveys

Performance Assessment Meetings

A Performance Assessment Meeting is held one-on-one between the individual and project manager. The project manager may solicit input from other team members about the individual's performance in advance of the meeting.

A significant aspect of the performance assessment meeting is the reflective self-assessment that the team member should execute in advance of the meeting. The meeting itself then provides an opportunity for the project manager to affirm or refute the individual's self-evaluation. The team member should come to the meeting prepared to lead a discussion about his/her performance on the team. Factors likely to be relevant include, but are not limited to:

- Hours worked
 - The number of hours the individual has engaged with the project should align with that individual's commitment level
 - For credit bearing students, the official institutional commitment is 40 hours of effort during the semester for each credit hour registered.
 - This includes hours recorded in categories: Working on tasks, Documentation, Team meetings, Project Review meetings and prep, Other
 - Hours committed to Collaboratory discipleship and team building exercises are valued and encouraged. Such commitments are rewarded within the credit bearing Project structure as a student who invests deeply, positively impacting individual performance evaluations.
- Prompt task completion
- Level of difficulty in tasks
- Collegiality
- Initiative
- Overall investment

Performance Assessment Survey

Another tool used to assess individual performance and to provide feedback so that individuals can grow as team members is an anonymous survey completed by all members of the team. Anonymity is preferred in this tool so that respondents are more likely to provide a candid assessment. Team members will be asked the following questions about each other:

- Person X consistently contributes to meetings by offering ideas or suggestions that demonstrate a collaborative spirit with the rest of the team

- Person X facilitates contributions from other team members by demonstrating respect for others' ideas and building upon them in a helpful way
- Person X completes assigned tasks on time
- Person X takes on tasks at a level of difficulty that is fair and reasonable considering his/her commitment level to the team and level of preparation (e.g. class year)
- Person X fosters a positive team climate
- Person X delivers the effort expected for the commitment level
- Person X demonstrates initiative by eagerly seeking out opportunities to help the team succeed.
- Person X invests deeply in the project activity or in the Collaboratory, as a whole, by working more hours than required for the commitment or by bringing a level of passion that is infectious to the rest of the team

Project Report Guidelines

Definition

Definition – A **project report** provides the reader with a comprehensive and timely perspective on the current state of the project. The format of the report shall align with the anticipated finished report, considering the audience of that final report. The report may include, during the life of the project, section headings that are known to be important but representing work not yet completed. The report is a living document that will be updated often, but updates should be saved as new versions so that old versions serve the purpose of archiving. Work that has been superseded or is no longer directly relevant should be removed from new versions of the report.

Report Framework

- Determine the audience for your final deliverable/report
- Develop an outline of the final report that makes sense for your topic and your audience

Updating the Report

- The project report should be updated (in a new version; save the old version for archiving) each work cycle.
- The version tracking table in the project report should be kept up-to-date

Report Narrative

- The report should begin with an executive summary or abstract that concisely states the overall purpose and goal of the project, along with the salient points of any conclusions and the current status.
- The goals and objectives should be clearly stated
 - What problem are you trying to solve?
 - Who cares about the success of the project?
 - How will you measure success?
 - Are the goals SMART?
- The narrative should be updated each work cycle. New information should be added, and outdated information should be updated or removed.
- The narrative should be comprehensive, but concise. It should also be cohesive across sections, even if written by different authors. Avoid including information about aspects of the project that are no longer relevant – maintain them in an appendix if the team feels strongly that this piece of project history needs to be included for the end reader.
- The tone should be professional and technical, not conversational.
 - Technical level: written for other engineers – not necessarily experts in your discipline and certainly not your project.
- The narrative guides the reader to appropriate project records
 - Include a summary or abstract of the project record within the report
 - Clearly state the implications of the record on the project
 - Not all project records need to be included – some are outdated.
 - Include an appendix with relevant but no longer timely project records

- In addition to citing project records within the narrative, include a list of all project records relevant to the report in a table of contents or works cited page
- The team is responsible for the entire report – even work that was done prior to you joining the project
- Final design drawings should be archived somewhere. Large sets of drawings should be in a project record. Important isolated drawings might be reasonable to include in the report.
- Use the project report rubric in this document to guide and self-assess your own work
- Include the report in your professional portfolio
- A sample outline is provided below. Plan carefully what types of things should be included in each section, and if each section is relevant for your project.

Figures

- Key figures, schematics, drawings, renderings, photos should be included in the report even if they are also in a record (e.g. not necessarily all figures; only those most helpful in clarifying key points or conclusions). The report should be a useful stand-alone document in itself and not require accompanying records in order to be intelligible.
 - All figures should be referenced in the narrative (why is this figure important/significant?) and include a caption (what is the figure?). See example on page 20.
 - Figures should be of an appropriate resolution, contextually clear, visually simple (not complicated with distracting background, etc)

Revision Tracking

Authors should briefly summarize meaningful revisions that have been made to the document since the previous version. This should be included as the second page in the document (immediately following the title page). Provided here are exemplar statements intended to help the student understand the level of granularity appropriate in the revision tracking section. Some statements might apply more readily to project records than to project reports.

- The abstract was updated and rewritten (Emily)
- A graph that plots temperature changes over time was added to the test results section (Jamal)
- Figure 4 was updated for clarity and professionalism (Greg)
- The narrative in the “test procedures” section was updated to summarize the Testing project record (Lakisha)
- The previous Testing project record and Results project record were combined to make this project record (Ted)
- This project record focused on material selection and is a subset of the previous Prototyping project record (Veronica)
- A section was added to describe the functionality of the prototype (Joel)
- The section about the PVC prototype was removed because it is no longer relevant to the project work (Randy)
- Grammar, spelling, and word choices were improved throughout the document in response to editorial comments by John Doe. (Helen)

Organization

The organization of the report should be intuitive and appropriate for the content and audience. There is not a prescribed outline (except a few sections noted below) that all project teams must follow; instead teams are expected to develop and adopt an organizational scheme that makes sense in their own context. A sample outline is provided below as a starting point, but additional sections could be included, some sections could be excluded, and the order could be changed where appropriate.

Sample Outline

1. Executive Summary or Abstract (required)
2. Problem Definition (required)
3. Project Goals (required)
4. Research
5. Design and Analysis
6. Prototype development
7. Testing and Evaluation
8. Summary of Proposed Solution
9. Implementation and Maintenance plan
10. Conclusion (required)

Project Report Essential Characteristics/Grading Rubric (Quality of Documentation)

Setup and Framing

Title Page	Include a descriptive title, updated revision chart, list of contributing authors, and date of most recent update.
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Abstract

Context	The abstract should very briefly describe the overall project context and the problem that needs to be solved. Later sections of the report will flesh this out in greater detail, but the abstract should quickly characterize the overall situation facing the project team or the team's client.
Contents Summary	The abstract should accurately and efficiently summarize the body of work contained in the project report. In most cases, this could be thought of as putting the table of contents into the form of a few sentences or short paragraph. This is generally NOT a historical summary of the entire project or even of the latest work cycle.
Conclusion	The conclusions or recommendations of the report should be apparent in the abstract. This is a living document, so conclusions should summarize the current status or the current thinking of the team even though they may change once more work has been done.

Communication – High Level

Organization	The goals of the report should be clearly stated. The conclusions should be concise and well substantiated. The flow of thought through the document should be intuitive and transparent (perhaps through sub-headings)
Balance	Seek an appropriate balance of communication media including written narrative, figures, tables, graphs, or photos. If the information is better conveyed graphically than through written text, take the time to prepare a

clear graphic. *Not all graphics from the project records should be duplicated in the report, but, at a minimum, key figures that help define the context of the problem or summarize the proposed solution should be included.*

Mechanics Carefully consider the audience and strive for an appropriate level of detail and tone in writing to suit their need and expectation.

Communication – Detail Level

Grammar/Spelling Grammar and spelling errors should be minimized in professional work

Appearance The document should be professionally word-processed and formatted. This includes consistent headings, margins, fonts, and text sizes, among other things.

Figures/Tables Figures and tables that are included should efficiently communicate specific information. They should be referenced in the narrative and appropriately captioned (see figures/tables earlier in this document)

Graphs Where graphs are used to convey information be sure to label the axes, include a legend, and consider appropriate line types. Do not accept the software's default formatting in wholesale; take the time to adjust formatting so that the reader can quickly and accurately understand the information shown in the graph.

Project Report Essential Characteristics (Quality of Content)

Problem Definition Clearly explain the problem that will be addressed and the stakeholders involved. Who cares about the outcome of the project and how will they be affected?

Narrative The written narrative (paragraph structure) should provide an organized and intuitive connection between the various aspects of the project. The narrative should set up various project records, often summarizing their findings and referencing the record where more complete information could be found.

Records Records are appropriately referenced and summarized in the report.

Content The content selected for inclusion in the report is necessary and efficiently informs the reader about important aspects of the project work. Avoid content that is redundant or irrelevant; it is not necessary for the report to mention everything the team has done if some of that work is no longer relevant to the project's current status.

Updates The project report should be up-to-date for the current state of the project. For projects of longer duration, the report should be periodically updated and cleansed of outdated and irrelevant information.

Conclusions Conclusions and recommendations should be clear and concise. For reports drafted while the project remains in progress, the conclusions should be consistent with the current status of the project even if they are likely to change once more work has been done.

Project Record Guidelines

Project Record Definition:

A **project record** documents the results of work undertaken to achieve a specific task associated with a project goal. The scope of this work is expected to be completed within a short (several weeks) period of time and often not require the efforts of the entire project team. Results or conclusions of the work documented in a Project **Record** are expected to be cited in the Project **Report**. Project records are living documents and should be updated if there is ongoing activity on the same topic (update is a new version; maintain the old version for archiving). It is understood that Project Records used during Project Reviews and cited in current Project Reports will at times be incomplete because work is ongoing.

Project Record Audience:

There are multiple audiences for a Project Record.

- Yourself:** Include the detail needed for you to recall the process and reasoning you used to reach your stated conclusion. You will reference this in the future
- Your Team:** Include enough detail for those following you to learn about this facet of your project at a sufficient level to pick up the work if this question needs to be revisited
- Project Review Panelists:** Include sufficient detail for panelists to ask well informed questions about your process and conclusions
- Partner/Client:** In some instances project teams will need to provide documentation to a client or partner. Preparing project records with this audience in mind limits the amount of re-writing needed at the project's completion.

Project Record Mechanics:

Planning Well

Before you begin work you need to:

- Identify with your advisor what type of project record will be used to report your process and results – Examples: Prototyping, Testing, Research, Engineering Decisions, Design, etc.
- Write the Goal statement. This should provide the context for your work – why was it needed to make progress towards a project objective?
- Create an outline of the record
 - Identify the section headings appropriate for the work being undertaken
 - Identify anticipated figures and tables

Abstract

After completing the rest of the document, write the Abstract. The Abstract is a summary of your document; it elevates the most important points. Please also note that one purpose of an abstract is to help a researcher know, in advance of reading the entire document, whether this document fits within their area of interest. Upon reading the abstract alone, the reader should have a very clear impression

for the context of the project, the key content of the document and the key conclusions of the document. A good abstract enables a prospective reader make an informed decision on whether or not they should continue reading. A good abstract will be understandable without prior knowledge of the project.

Figures/Tables

- Anticipate that most project records will require some combination of figures and tables to summarize or convey key information
- Figures include drawings, photographs and graphs of results.
- Every figure and table must be labeled with an identifying number or letter and a caption. Typically figure captions are shown below the figure and table captions are above the table. To insert a caption in Microsoft Word, right-click on the figure or table and choose “Insert Caption.” (example on the next page)
- The caption includes enough information for the reader to know what the figure or table is without reading the text of the record
- The written narrative must reference all figures and tables. “Figure 3 shows the prototype as set up in the testing rig.”
- Figures and tables should be located close to the text which references them; either on the same page or the next page.

Figure/Table Example – Captions and References:

The previous investigation of appropriate testing protocol determined that we would use the PH1000 meter for the testing of all our water samples. Use of this device and the set-up of the test is shown in Figure 1. All samples collected from the various scenarios under study were tested by the same means. The pH data from the tests is summarized in Table 1. It is apparent from the table that parameter 3 has the most impact on the water’s pH.



Figure 1. Test setup using the PH1000 meter.

Table 1. Summary of measured pH for all water samples.

Sample	Test Scenario	Measured pH
A	Control	7.0
B	Parameter 1	6.8
C	Parameter 2	6.6
D	Parameter 3	9.1
E	Parameter 4	7.2

Citations

Cite the source of any claim that you make unless one of the following statements is true

- The claim springs directly from measurements or analysis undertaken as a part of the record. Data or other items coming from other project records should cite those project records.
- The claim is commonly understood to be true within your profession’s expertise.

Revision Tracking

Refer to the “Revision Tracking” section under Project Reports; apply the same concept to Project Records.

Documenting Unresolved Issues

If the work documented in a project record is still in process, include a summary of outstanding questions or work needing to be done to finish the goals articulated at the beginning of the effort. At times the work documented in a project record leads to the need for additional work which will be included in a different record. Document the issues identified by the current effort that are initiating that new phase of work.

Professionalism

Project records should be written for a well-informed audience. The tone of writing should be professional, not conversational or informal. Slang and casual phrases should be avoided.

Content Expectations

There are some general expectations of all project records that are explained in the next section. Following that, note that each category of work (prototyping, testing, etc.) has a unique and specific set of expectations. Refer to the pages that follow.

Level of Effort

The level of work involved with drafting the current version of a project record will be characterized by one of the following statements:

- (2) Nearly the entire document was drafted in this work cycle
- (2) The document was started in a previous work cycle but was substantially updated in this cycle
- (1) The document was nominally updated after being drafted in a previous work cycle
- (1) The document was started in this work cycle but is a work in progress and not nearly complete
- (1) The record summarized activity that is trivial to document, such as meeting minutes or communication records

Project Record Categories, Summary and Definitions

Project records shall be of high quality in terms of documentation (see *Essential characteristics of all Project Records*) and of high quality in terms of content (*Specific Content Expectations* are clarified for each of the categories defined below).

Problem definition - often involves investigation that better clarifies the problem that must be solved or the specifications of the end user.

Communication - records summarize salient points from key correspondence that impacts the problem definition or design process.

Research - often involves careful investigation of a particular question while considering appropriate sources of information.

Analysis - generally refers to modelling (often mathematically) some physical reality in an existing or proposed design in order to determine some specific performance metric – force in a member, flow in a pipe, etc.

Engineering decisions - often involve a non-trivial choice between two or more alternatives. This can range from choosing which prototype design to move towards final design or which supply to use for sourcing a particular raw material.

Design: Biomedical - appropriate for any device that interacts with the human body or bodily fluids. There are specific considerations such as safety and biocompatibility that need to be examined when the device is intended for use in patient health.

Design: Mechanical/Electrical - involves the careful selection of component sizes, materials, and other details to refine a conceptual mechanical design and schematic, board, and wiring details for electrical designs.

Design: Civil/Structural - often includes development of plans for something that will be built only once and will not involve prototyping or other iterative development.

Design: Software - involves the planning and organizing of a section of code that needs to be written.

Prototyping - often involves physical or analytical construction of something intended to simulate portions of a future completed design.

Testing - often involves verifying the performance level of an existing element or anticipating its performance by evaluating a prototype.

Testing: Software verification - involves the testing of developed code to ensure functionality and accuracy.

How-to/Training - involves developing a clear procedure for others to follow, such as an assembly sequence.

Preliminary/Conceptual design - involves development of ideas and concepts that will be vetted as potential solutions for a problem and advanced to final design.

Other - Wait, do not default to choosing 'other' because you did not diligently consider the other categories. Choose other only if the project record truly does not align with another category.

Essential characteristics of all Project Records (Quality of Documentation)

Setup and Framing

Title Page	Include a descriptive title, updated revision chart, list of contributing authors, and date of most recent update.
Title	The title itself should be descriptive and intuitively understood by the reader.
Classification	The record should be classified as a particular type – prototyping, testing, etc.

Abstract

Context	The abstract should clearly explain how the work documented in this project record fits within the context of the overall project. What is this project about? Why is this work being done and how will its conclusion affect the project?
Contents Summary	The abstract should accurately and efficiently summarize the body of work contained in the record. In most cases, this could be thought of as putting the table of contents into the form of a few sentences or short paragraph. This is generally NOT a historical summary of the entire project or even of the latest work cycle.
Conclusion	The conclusions or recommendations of the record should be apparent in the abstract.

Communication – High Level

Organization	The goals of the record should be clearly stated. The conclusions should be concise and well substantiated. The flow of thought through the document should be intuitive and transparent (perhaps through sub-headings)
Balance	Seek an appropriate balance of communication media including written narrative, figures, tables, graphs, or photos. If the information is better conveyed graphically than through written text, take the time to prepare a clear graphic.
Mechanics	Carefully consider the audience and strive for an appropriate level of detail and tone in writing to suit their need and expectation.

Communication – Detail Level

Grammar/Spelling	Grammar and spelling errors should be minimized in professional work
Appearance	The document should be professionally word-processed and formatted. This includes consistent headings, margins, fonts, and text sizes, among other things.

Figures/Tables	Figures and tables that are included should efficiently communicate specific information. They should be referenced in the narrative and appropriately captioned (see figures/tables earlier in this document)
Graphs	Where graphs are used to convey information be sure to label the axes, include a legend, and consider appropriate line types. Do not accept the software’s default formatting in wholesale; take the time to adjust formatting so that the reader can quickly and accurately understand the information shown in the graph.

Category-Specific Content Expectations

Each project record shall satisfy the minimum expectations described in the following sections for its particular category.

Problem Definition

Problem definition often involves investigation that better clarifies the problem that must be solved or the specifications of the end user.

Problem definition records will typically address the following items:

Statement of Need	The record should clearly define and articulate the need – what is the problem that must be solved. If conducted in the midst of an existing larger problem, one might only need to clarify what additional information about the problem is needed and why it is being sought at this stage of the design.
Investigation	Summarize the data or other evidence that is gathered in order to better understand the need.
Performance Specification	Carefully describe the specification by which the solution’s performance will be measured. <i>The solution will be considered successful if costs less than fifty dollars, purifies 50 gallons of drinking water per day, and can be maintained by local villagers.</i>

Communication

Communication records summarize salient points from key correspondence that impacts the problem definition or design process.

Communication records will typically address the following items:

Topic	Clearly describe the primary topic or purpose of the communication record. <i>The following correspondence clarifies the partnership obligations of the Collaboratory and of Forward Edge.</i>
Content	Often the correspondence can be consolidated and summarized to include only main points. Carefully track the dates and sources of the correspondence. <i>Skype call on June 6. Email received by John Doe from Harry Smith on October 2.</i>
Conclusion	Conclusions based on the correspondence that impact the project should be summarized and clearly stated. <i>Rio Missions indicated that lumber is much harder to source locally than cable so the design will include minimal amounts of lumber.</i>

Research

Research often involves careful investigation of a particular question while considering appropriate sources of information.

Research records will typically address the following items:

Topic Selection	The topic or purpose of the research should be clearly defined and articulated.
Sources	The sources of information used should be appropriate for the purpose of the work. This could range anywhere from a merchant's website to a design standard or a journal publication.
Content	Relevant information from the various sources is adequately summarized.
Citation	Citations should be such that one could find the same information again in a second search, if necessary.
Substantiating Claims	Any claim made in the written work should be adequately substantiated by citation and the narrative itself. Oftentimes tagging a citation on the end of a line that makes a claim is dissatisfying to the reader – it helps to include in the narrative a brief summary that includes that sources right to make the claim.
Conclusions	The research work ends with a clear conclusion or recommendation based on the information available.

Analysis

Analysis generally refers to modelling (often mathematically) some physical reality in an existing or proposed design in order to determine some specific performance metric – force in a member, flow in a pipe, etc.

Analysis records will typically address the following items:

Methodology	Why did you use the analysis method you did? This could include your choice of equation to use (<i>the assumptions of that equation match the reality of this situation</i>) or the software program to use (<i>the situation required an analysis more robust than could be done by hand, so a finite element model was needed</i>). The methodology chosen should be consistent with the needs of the project at this phase, both in terms of accuracy and effort required.
Input Specifications	The parameters (such as boundary conditions) input to the mathematical model are a reasonable and appropriate representation of the physical situation.
Assumptions	Some assumptions are almost always made in analysis since it is impossible to precisely model most physical scenarios. The assumptions inherent in the analysis should be carefully identified and their impact on the results accurately summarized (<i>this choice of boundary condition will lead to conservative results since it will lead us to over-estimate the stress</i>)
Accuracy	The analysis results themselves should be checked for accuracy. Often this can be done through comparison with results of similar situations known to be accurate or by bounding the solution between extreme scenarios.
Precision	The precision of the results and the potential for error should be considered and, to the extent possible, quantified.
Conclusions	Do not assume the results “speak for themselves.” The record should clearly and succinctly state conclusions that are being drawn from the analysis results and noting the impact those conclusions have on the future of the project.

Engineering Decisions

Engineering decisions often involve a non-trivial choice between two or more alternatives. This can range from choosing which prototype design to move towards final design or which supply to use for sourcing a particular raw material.

Engineering decision records will typically address the following items:

Criteria	What are the criteria that will be used in deciding which alternative is most appropriate? What must be true of the chosen alternative?
Describe Alternatives	What are the alternatives that seem to be available and satisfy at least some of the criteria? These are the choices available in this decision.
Constraints/Impact	Demonstrate that the constraints and impacts on various areas (e.g. budget, social impact, environmental impact, implementation timeline) are well understood.
Prioritizing Criteria	The criteria relevant in the decision are appropriately prioritized or ranked against each other.
Justification	The final decision between alternatives should be well explained, rationalized, and justified.

Design: Biomedical

Biomedical designs are appropriate for any device that interacts with the human body or bodily fluids. There are specific considerations such as safety and biocompatibility that need to be examined when the device is intended for use in patient health.

Biomedical Design records often address the following items:

Biocompatibility	Any aspects of the device that come into contact with the patient should be assessed for biocompatibility. Consider how the properties of the materials in the design interact with the user. If the material contacts the skin, hygiene, friction, and comfort should be considered. If the device does not contact the patient, this should be noted.
Material Properties	The materials in the design should be chosen carefully to maximize patient health. For example, this may mean absorbing force, deforming slowly over time, not reacting to bodily fluid, or being durable enough to withstand a fall. The material choice should be clearly justified in the context of patient health.
Safety	Consider normal operation and possible failure modes of your design and how they might affect the safety of the user.
Drawings	All components of the design should be drawn according to engineering standards with full use of units and labels. The type of drawing should correspond to how the device will be manufactured (i.e. SolidWorks drawing, optical table layout, plasmid map, etc).
FDA Considerations	The designer should give preliminary consideration to FDA guidelines for medical devices. What class (I, II, or III) is this device anticipated to be? Could this device be considered 510(k) exempt? Will it have substantial equivalence to an existing device? If not, what FDA standards and testing may need to be considered as the design progresses?

Design: Mechanical/Electrical

Mechanical design involves the careful selection of component sizes, materials, and other details to refine a conceptual design. Electrical design involves an understanding of the specifications and desired outcome of the circuit, which will guide the circuit design, component selection, board layout, and wiring and board interconnections.

Mechanical and Electrical Design records often address the following items:

Context	Clearly describe the context of the work being done – how does this fit into the larger project?
Specifications	Demonstrate a strong understanding of the specifications (what does the finished design need to do?) from the client. If the design is of a particular component/subsystem that becomes part of a larger design, indicate the requirements of the component/subsystem that will make it compatible with the finished design.
Conceptualization	Use tools appropriate to the task to aid with design conceptualization and visualization. This could include Solidworks, hand sketches, or physical models for mechanical design and schematics and board layouts for electrical design.
Detail	The level of detail in the design itself, and its documentation, should be aligned with the stage of development. Final (or nearly final) design requires much greater attention to detail than concept development. Final designs should include a materials list with vendor information and items costs.
Visualizations	Provide appropriate visuals – sketches, photos, renderings – to help the reader quickly understand what you have developed. The visualizations should be well labeled and captioned. Electrical design might include screenshots from oscilloscopes or other test equipment or include a table of achieved parameters.
Description	Describe the features of the design at a level of technical detail appropriate for the intended audience.
Conclusions	Summarize important findings from the design exercise, including any remaining questions that must be addressed in future work.

Design: Civil/Structural

Civil/Structural Design often includes development of plans for something that will be built only once and will not involve prototyping or other iterative development.

Civil/Structural Design records often address the following items:

Context	Clearly describe the components of the overall design that are documented in the project record.
Standards	Summarize the design standards that will be used in guiding the design.
Analytical Model	Describe and substantiate the analytical model that will be used to anticipate demand on the structure or to predict its performance.
Accuracy and Safety	Describe the process used to ensure that analysis and design results are accurate and sufficiently 'safe.'
Communicating Results	The outcome of the design should be clearly communicated so that it can become part of the construction drawings or documents at some point towards conclusion of the project. This should often be presented in the format of a drawing or the language of a specification.

Design: Software

Software design involves the planning and organizing of a section of code that needs to be written.

Software development records often address the following items:

Purpose	Clearly describe the purpose of the software that will be developed.
Flowchart	Develop a flowchart or other means to describe the high level organization and functionality of the planned program.
Platform	Select and justify the programming platform/language that will be used for the software development.
Modules	Divide the program into various modules and clearly describe the purpose and function of each.
Conclusion	Summarize important findings from the design exercise, including any remaining questions that must be addressed in future work.

Prototyping

Prototyping often involves physical or analytical construction of something intended to simulate portions of a future completed design.

Prototyping records will typically address the following items:

Documentation	There should be thorough records of the prototype itself. Documentation might include clearly dimensioned fabrication drawings, blocks of code that are organized and include comments or a flowchart, or photographs of prototype assembly.
Prototype Development	Take reasonable steps during the development of the prototype to ensure accuracy and reasonableness. For instance, simple mock-ups or computer renderings may be necessary to ensure geometry, fit, and basic function of the prototype will be as intended.
Representation	The prototype should be appropriately representative of the future completed design considering the stage of design. For example – the prototyping approach must be informed by the design stage (concept review or detailed design) and the intended use of the prototype (aesthetic mock-up, geometric fit mock-up, performance testing, etc).
Component Selection	The choice of component parts used to build up the prototype should be thoughtfully considered in light of intended use, budget, etc.
Fabrication	Fabrication of the prototype should be carefully planned so that work can be done efficiently with minimal impact on others (e.g. lab technicians, other project teams).
Workmanship	The prototype should be neat with an appropriate level (depending on intended use) of care given to development.

Testing

Testing often involves verifying the performance level of an existing element or anticipating its performance by evaluating a prototype.

Testing records will typically address the following items:

Purpose of Testing	The overall purpose of the test should be clearly defined and articulated. <i>The results of this test will help in determining whether the existing system needs to be replaced.</i> Notice below that other aspects of setting up the test are driven by the test's purpose.
Identify Parameters	The team planning the test should carefully identify all parameters that could significantly impact the test results. <i>Temperature is known to influence performance of this material so that was held constant throughout the study. Relative humidity is known to not affect performance, so it was not monitored.</i>
Experimental Set-up	The testing procedure is likely to produce data with a level of accuracy and precision appropriate for the purpose of the test.
Test Documentation	The testing procedure should be documented in a level of detail sufficient for someone else to reproduce the test, if needed.
Data Collection	Collecting data from a test can range from the primitive (e.g. a tape measure) to very sophisticated electronic devices. The choice of the data collection technique should be aligned with the purpose of the test and the required precision and accuracy.
Presentation of Data	The data that is collected should be organized and presented in a format that is intuitive and easy for the reader to interpret. Carefully consider whether the data should be presented in a table, a graph, or some other means. Also consider whether it's necessary to show ALL the data or if an important subset of the data is most important to the reader.
Analyze Results	Do not assume that the results "speak for themselves" even if it seems like the conclusion is self-evident upon inspection of the data. The narrative should clearly summarize "what the data means" and highlight key points. <i>The performance data shows that the filtration system is capable of passing only 1.2 gallons of water per minute, compared with the anticipated demand of 2.5 gallons per minute.</i>
Conclusions	Interpret the results for the reader in a way that clearly summarizes conclusions that will be made based on the testing that has taken place. <i>Since the capacity of the filtration system is clearly below the anticipated need of the community, replacement of the system is recommended.</i>

Testing: Software Verification

Software verification involves the testing of developed code to ensure functionality and accuracy. Software verification records often address the following items:

Context	Clearly describe the intended purpose of the code that is being verified and its role within the project.
Proof conditions	Develop a set of conditions or parameters that will be used in proof testing the code. In other words, determine how many successful runs and with what specific conditions must be observed in order to declare the software functional and accurate.
Conclusion	Summarize relevant conclusions from the verification exercise.

How-to/Training

How-to/Training involves developing a clear procedure for others to follow, such as an assembly sequence.

How-to/Training records often address the following items:

Context	Clearly describe the intended purpose of the training guide
Written narrative	The written narrative should be clear and concise with the process or procedure explained clearly and efficiently.
Non-verbal communication	Training documents often include strategic and perhaps frequent use of figures or pictures that clearly communicate various steps in the activity.
Detail	A training document must include the appropriate level of detail for the audience or end-user. It must be sufficiently detailed so that no steps in the process are left to the imagination, but not so overly-detailed that the communication is inefficient or the end-user is frustrated by trivial information.
Conclusion	Summarize relevant conclusions from the process of developing a training document.

Preliminary/Conceptual Design

Preliminary design involves development of ideas and concepts that will be vetted as potential solutions for a problem and advanced to final design.

Preliminary design records often address the following items:

Context	Clearly describe the intended purpose of the concept development work. (Examples: 1 - It leads to prototype development with functionality that will demonstrate some specific functionality of the proposed finished product. 2 - It is part of developing a list of many options that will be compared with one another for selection to move into final design.)
Problem Statement	Development of design alternatives should demonstrate a working understanding of the problem statement that define a successful design.
Specification	Development of design alternatives should demonstrate a working understanding of the specifications that define a successful design.
Assessment	Documentation should indicate initial assessment design alternatives, citing strengths and weaknesses of various ideas in meeting the need of the problem statement.
Description	Documentation does not need to approach that required of final design, but a description sufficient for future generations of the team to recall what was considered (as an example) is essential.
Conclusion	Summarize relevant conclusions from the process of developing a preliminary design.

Other

All generic project records should include at least the following elements:

Context	Clearly describe the context and purpose of the work that is being documented.
Content	Develop well-organized content aligned with the purpose of the work.
Conclusion	Summarize relevant conclusions and the impact they have on the project.