

Progress report 3: Design evaluation report

Goal: To critically evaluate the performance of your final design and compare it against competing designs in the context of this competition. The performance of your robot will be referenced to the design requirements and specifications you listed in the CDR, performance calculations presented in the DDR and competition requirements. Given the competitive nature of this project, your robot may have met all the requirements, but still have been beaten by another design. Thus, you also need to evaluate aspects of the competing designs that were advantageous/disadvantageous compared with your design.

Page limit: Max 15 pages (not incl. title page). You can use up to 3 additional pages for appendices to present calculations/data that are referred to in the body of the report. In addition, please include a final bill of materials in the appendix.

Suggested structure:

Exec summary: Summarises the report (1 page max) – should include any key results/outcomes, which may be numerical.

Introduction: Briefly describes the project (provides context for the report) and outlines what the reader can expect to find in the rest of the report. Relates this report to your previous conceptual and detailed design reports, and the final competition.

Design Description: Present an overall description of your final design, as used in the competition (to make this a standalone report). This should probably include things such as high-level functional block diagrams for the complete robot and major sub-systems, high-level flow-charts or state-diagrams for the software/strategy. You should explain and justify any significant deviations or developments from the designs presented in the CDR and DDR if relevant.

Evaluation: The evaluation section should consist of 3 related parts:

1. An evaluation and review of the performance of your robot in the competition (and any relevant, pre-competition testing) against the requirements you specified in the original CDR and any subsequent modifications of these. Quantitative evaluations are expected. Discuss particular successes and failures of both systems and strategies, and how these influenced the performance of your robot in competition.
2. An evaluation of the performance of 4 other robots. These should ideally be robots against which you competed. If you competed against more than 4 others, you can select which 4 to evaluate. If you competed against fewer than 4, select 1 or 2 others which you observed and evaluate your design against these. Basic quantitative evaluations are expected, so it would be good to pay attention to pick-up times, speed etc of your opponents. A table might be a nice way of summarising this data. What were the features that made a successful robot and which of these did your robot have/not have?
3. Post-mortem summary– what 1 or 2 features/capabilities would have made your robot a winner? Quantitative descriptions, e.g. the ability to detect packages from > 50 cm.

Briefly discuss the performance of your robot, its limitations, feasible/realistic methods that you could use to improve performance based on its performance and that of the other robots.

Conclusions: Is the robot 'fit for purpose' as defined by your original requirements PLUS the competition environment? Or would it require some further development?

Contribution statement: As you did for the other reports. This should cover the contribution to the entire project, not just the report writing.

****Note:** Please include a brief description of the circuit board made (and used in the competition) by each team member in the contribution statement. If a team member didn't make a circuit board, please note this – only that team member will be penalised.

Marking: The following table provides a guide to how we will assess these reports. Use it to judge which sections are the most important and where to use your pages.

Marks	Description
5	Exec summary
10	Introduction
15	Design Description
30	Evaluation of your design
20	Evaluation of competing designs
20	Overall flow and content of the report

Marks within these sections will be heavily influenced by the following factors:

Content:

- Concision/ brevity, but with detail is important. Say what is important and why it is important.
- Exploded view drawings or photos can be helpful to show the physical system. These should be related to physical and functional architecture block diagrams.
- While you're writing this, try to see the report from the point of view of a client, or another engineer trying to evaluate this finalised system and decide whether to 'take it into production,' or continue development. Which aspects of the performance were particularly important? Is your evaluation described in enough detail?
- Final bill of materials (in appendix) – all components included on the robot, with part-numbers, quantity, and costs where available/appropriate.
- Comparisons between values you calculated in the DDR (e.g. battery life) and actual performance.
- Comparisons between experimental results (ideal situations) of prototype testing and the performance during competition e.g. from 10 tests with 11 weights in an empty arena, the robot averaged a 50% collection in 5 mins, but during competition this reduced to 20% due to obstacles and the opposition robot.
- Comparison with original requirements and against other robots, as described above.
- In your report, be sure to include relevant methods from lectures: Requirements specs, functional block diagrams, FSM's, flow charts, algorithms for control, or strategy (not code, but detailed enough to explain what is going on), fault containment maps (if you have fault tolerance), architectural block diagrams. But, be sure that these methods are actually useful and discussed/referred to in the report in a meaningful way – don't just plonk them there because you 'need' to.

Presentation:

- Ensure that the writing is coherent – can too easily become disjoint when several people are contributing. Make one person responsible for the overall report. Their job is to read the assembled writing and make sure it flows together.
- We will be taking more note of grammar and writing style in this report. Written communication will form a very important part of your futures, as a professional engineer, post-grad, or even before then for CV's cover letters, and work reports. You need to be able to write well for clients, colleagues, manufacturers, suppliers, potential employers, journal papers, etc. Start perfecting your writing now. Useful references for report writing and style can be found in the library and on the internet:
 - A very good summary for writing design reports can be found:
<http://www.me.umn.edu/education/undergraduate/writing/How-to-write-a-Design-Report.pdf>
 - Also, the library has some good resources:
<http://www.sciencedirect.com.ezproxy.canterbury.ac.nz/science/book/9780750646369>
- Photographs can be useful for illustrating points about design or requirements.