

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.

To meet these requirements, this report needs to present enough quantitative detail that you can tick off (and justify) your requirements as having been met (or not), and rate the final competition performance of your robot against others. The report also needs to be presented in a professional manner. It needs to be well written and with well thought out content. Comparisons between robots need to be meaningful and well thought-out – For example, don't compare speed, if speed was not an important factor in the performance/outcome.

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. This should not be a 'verbose table of contents.'

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. This should be a standalone report with updated drawings and diagrams reflecting changes made between your detail report and the competition. This doesn't require the technical depth of the detail report! Instead, explain and justify any significant deviations or developments from the designs presented in the CDR and DDR if relevant.

You should probably include things such as updated cut-away drawings, high-level functional block diagrams for the complete robot and major sub-systems, high-level flow-charts or state-diagrams for the software/strategy.

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

1. A review and evaluation 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. Also, discuss any faults/failures that occurred in relation to your FTA from the DDR.
2. An evaluation of the performance of 3 other robots. These should ideally be robots against which you competed. If you competed against more than 3 others, you can select which 3 to evaluate. If you competed against fewer than 3, select another, which you observed, and evaluate your design against these. 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.

Conclusions: Was your robot 'fit for purpose' as defined by your original requirements PLUS the competition environment? You should use this conclusion to fit the narrative you've created in the process of writing about your competition performance, concepts, subsystems, and build quality? How could you have used further development time, or where did you leave room to improve?

Contribution statement: As you did for the other reports. This should cover the contribution to the entire project, not just the report writing. Do put some effort into this as we may use it to moderate grades within teams.

Marking: The following table provides an approximate guide to the relative weighting we will place on sections of the report (not a marking schedule). Use it to judge which sections are the most important and where to use your pages.

Marks	Description
20	Written communication
20	Visual communication
20	Evaluation of your design
20	Evaluation of competing designs
20	Overall flow and structure 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:

- Consider using carefully thought out figures/plots in place of wordy descriptions.
- 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 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:
 - Jacqui's notes from semester 1.
 - 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.