Personal Design Decision

Overview

This document defines the scope and structure of the Personal Design Decision (PDD) assignment. The PDD requires that you develop a detail-level, selection-style[1] design decision that pertains to your own life experience. The primary goal of the assignment is to practice bringing engineering rigour and an engineering mentality to your everyday activities.

Stakeholders

- You, a student engineer who needs to practice applying an engineering mentality and bringing engineering rigour to different types of design activities.
- Your Phase II – and future – engineering design teams who will benefit from having members with greater skill at making engineering design decisions.
- The Teaching Team, who are responsible for providing you with support and who expect their students to demonstrate both engineering rigour and an engineering mentality.
- Other Engineering students, who may also need to make a similar decision and who could benefit from your investigation and recommendation.
- Your PDD assessor, who has between 20 and 30 minutes to both assess and evaluate your submission.

Requirements

Objectives

The high-level objective of the PDD is to have you practice each element of an engineering design activity (framing, diverging, and converging) by making a detail-level, selection-style design decision. To enact this high-level objective, and to provide you with some additional guidance[2], the assignment has the following detailed objectives:

1. Select an opportunity with personal relevance that can be framed as a selection-style design decision.
2. Frame an opportunity as a design decision that has a set of requirements, including appropriate objectives, metrics, criteria, constraints.
3. Diverge in order to generate a viable set of candidate alternatives.
4. Converge to a single alternative by assessing the candidate alternatives against the requirements to determine the "best" one.
5. Recommend a single alternative that resolves the opportunity.
6. Support your recommendation with research that is both credibly-used and credible.
7. Communicate clearly in all aspects of your PDD, but with specific focus on the framing and recommendation.

[1] These descriptions will be introduced in Lecture 13.

[2] As discussed in Lecture 01, completing an engineering design activity usually involves practicing each of the different elements of design (framing, diverging, converging) multiple times and in no specific order. The list of detailed objectives in this assignment presents a highly idealized, unrealistic model of engineering design because of the linear limitations of textual lists. You should expect to (re)frame, (re)diverge, and (re)converge multiple times before reaching a single recommended alternative – with appropriate supporting documentation.

Constraints

The PDD must meet the following constraints[3]:

1. It **should not** exceed (≤) five (5) pages, including figures but excluding references.
2. Relevant extracts from any used references **must** be included in an Appendix titled "Source Extracts".
3. It **must** be structured as a Design Report
4. It **should not** be more than (≤) 1200 words of text, excluding references.
5. It **should** be formatted with 11-point font, 1.25 spacing, and one-inch margins on standard letter-sized paper.
6. It **must** be submitted as a single PDF file.
7. The submission **must** have a file name that describes the decision opportunity but **must not** include the final decision (such that (e.g.) a classmate could quickly scan a list of titles and identify interesting or relevant PDDs).
8. The author's name **must** be included; other identifying information about the author **must not** be included.
9. It **must** include quantitative metrics and **should** include qualitative ("rubric style") metrics
10. It **should** include both continuous (e.g. "{ more, less } is preferred") and discrete (e.g. "rubric style" or "past this point there is no difference") criteria

Criteria

Criteria are used to determine "better". Unless otherwise stated, "more" of a given criterion is considered better. The metrics associated with the criteria can be found on the Independent Assessment Tool (IAT) available on the course downloads site.

1. Legitimacy of the opportunity (that is being resolved through a selection-style design activity).
2. Quality of the requirements that frame the opportunity.
3. Quality, legitimacy, and credibility of candidate alternatives

   The number of candidate alternatives considered will be interpreted as one aspect of "quality". When selecting from a set of alternatives, a common approach is to designate one alternative as the "reference" against which the other alternatives are compared. As such students should expect to identify at least four (≥4) alternatives – one (1) to use as a reference and at least three (≥3) that are viable alternatives. This requirement is a criterion, not a constraint, so that students can limit the time they spend searching for (potentially non-existent) alternatives.
4. Quality of the decision-making process.
5. Quality of the justification for the recommendation.
6. The quality, credibility, and structure of your engineering arguments, including their basis in appropriate used and credible engineering evidence.
7. The quality of the design of your report, including appropriate use of structure and introduction.
8. The coherence and clarity of your English written and visual communication.

[3] Unlike in industry, or in other academic contexts, violating a constraint on this assignment will **not** result in the assignment being excluded from future considerations (e.g. not being assessed or evaluated and instead considered not to have been submitted). Instead an appropriate penalty will be applied to the final evaluation.

Guidance and Guidelines

About Metrics

As this represents a beginning (individual) attempt to develop a set of requirements, we want to acknowledge that metrics are particularly challenging. We accept that in this assignment you are going to exercise a degree of common sense in establishing metrics, particularly because the design decision in this case is "personal".

Where possible look for metrics that allow you to measure or quantify an assessment – this could be size, time, etc. Qualitative metrics, in rubric form, are also appropriate where quantification is not feasible or tractable.

Above all try to develop metrics that are practically useful (e.g. that you actually use to evaluate the candidate alternatives) as opposed to metrics that are theoretically applicable (e.g. that you cannot use given the time and equipment available to you).

About Constraints

Developing constraints can be an extremely time consuming process. The PDD assignment is intended to provide you with practice on all aspects of selection-style engineering design. Therefore assuming quality metrics, it is more important that your constraints be useful and within an approximate order of magnitude of the "true" value (e.g. accurate) than that they be correct down to the decimal place (e.g. precise).

Above all avoid "overreaching" by stating requirements as constraints when there is insufficient justification for a hard limit.

Format

A formal design report should include an engineering introduction, structured headings indicating sections, and a brief conclusion. The introduction should provide the framing, purpose, and overview of the report. The internal structure of the report, as indicated by headings (and subheadings, where necessary) should be governed by the content of the report. Any headings should be informative in nature (rather than generic). The conclusion can provide a summary **or** simply present the report's conclusion. Aside from these requirements, the format, structure and writing of the report are design decisions you need to consider, with the objective of the coherent and clear communication to your primary stakeholders, the teaching team.