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Product Characteristic

A product characteristic (PC) is an attribute of a product that describes its ability to satisfy its purpose in a larger system. PCs describe what a product must *be*. They serve as labels by which to group other kinds of requirements.

PCs describe what a product ought to *be*, but not what the product ought to *do*. As such, PCs can almost always be described using adjectives and adjectival phrases. A PC is *never* phrased as a verb (that what a functional requirement is for).

At first glance, PCs might seem almost vacuous, contributing nearly nothing to the study of the design problem. However, this is not really the case. A common source of error in design is that the designers will forget to consider the impact of one or more PCs in their work. It is human nature: designers will tend to focus on issues that are of particular importance to them, and expect someone else to take care of other issues. Sometimes, some issues will "fall through the cracks" resulting in a poor design[1].

If you think about it, there are some PCs that every designed intervention has. Because of this we can define a fundamental list of PCs that everything you design will *be*. The real questions are *how* and *to what extent* will your interventions exhibit these characteristics.

To simplify matters in this course, **all teams must use *only* the following five product characteristics**.

Functionality
> Does the design intervention actually do what it's supposed to do? Does it fulfil its intended role in a larger system? Does it bring about the expected/preferred situation?

Usability
> Can users use it? Can they use it safely, easily, even enjoyably?

Producibility
> Can the intervention be manufactured/assembled easily and robustly?

Maintainability
> Can the intervention be maintained easily and well? Does it even need to be maintained? How inconvenient is maintenance to users?

Sustainability
> What impact does the design impose on the environment? How long will the product last? What happens to it at its end of life? How many people can afford it and for how long?

None of the questions above are binary - there are no *"yes-or-no"* answers. The answers to all these questions exist on a spectrum: any design can be ranked on how much they are better or worse with respect to each of these five PCs.

> ***Focus on Functionality and Usability*** In one-semester design courses, it is very difficult to cover all necessary requirements for all five PCs. Since quality is more important than quantity in this course, make sure you have *functionality* and *usability* as well addressed as

> possible, even if that means neglecting the others somewhat.

There are many possible adjectives that *could* be PCs, but are not included in this list.

- For instance, durability, lightweightedness, robustness, and safety, are all adjectives that could be used to capture important aspects of a design.
- There are two significant reasons for not using these other adjectives.
    1. They partly overlap in meaning with one or more of the five PCs above. Overlapping PCs confuse matters and increase the odds of eventually creating conflicting requirements.
    2. They can all be represented by constraints on the five PCs or on various FRs. For instance:
        - *durability* can be captured with constraints on wear, product longevity, time between maintenance, etc.,
        - *lightweightedness* can be captured with constraints on weight,
        - *robustness* can be captured with constraints on the behaviours a product has when its operating inputs vary near or beyond its design limits, and
        - *safety* can be captured with constraints on failure modes and effects, protection of users, avoidance of accidents, etc.

analysis
[1)]

And a poor design equates to a poor grade.