Design strategy

Why you do it

The design strategy will help your team:

- Decompose your problem into subfunctions that allow for effective concept generation
- Justify and record your concept selections to give your project credibility
- Secure approval and guidance on its project from manager/sponsor and set expectations for reporting project status and tracking changes that may occur during building and testing.

Preparing the design strategy

The design strategy document details approximately what you plan to build, how you arrived at the choices you selected, and how you expect the final design to meet your design criteria. The document will include your problem decomposition, brainstorming ideas, and key design decisions.

The design specifications, brainstorming/ideas for solutions, and decision matrices all support the development of the final strategy. The design strategy document should not fully detail all of this supporting material, but it should summarize the alternatives you considered and the methods you used to arrive at your final strategy. It is often tempting to provide this information chronologically ("First we tried A, but that didn't work. So we tried B.") Instead, begin your design strategy document with the strategy you chose. Then, in ensuing sections, break down your strategy into components and discuss how you arrived at each one.

The structure of the design strategy document will depend highly on your project. General guidelines are outlined below.

Problem Decomposition

Depending on the complexity of the system, it is often necessary to consider the various elements of the system separately. For this purpose, the process of *problem decomposition* can be applied. Generally for these projects, *functional decomposition* is ideal as it is used to separate the subfunctions of the system so that they may be addressed independently. In this process, the inputs and outputs of the system must first be identified. Each of these will generally be from one of three categories: energy, materials, and signals. Some of these categories may not be applicable for every project and some projects may require multiple inputs and/or outputs from one or more categories. The form of an overall function diagram, which is used to illustrate this process, is shown at the top of the Figure 1. After identifying the inputs and outputs into the full system, decomposition is performed by expanding the single

block diagram in order to address how each of the inputs are handled by the system. The function diagram with subfunctions will a form similar to the bottom of Figure 1.
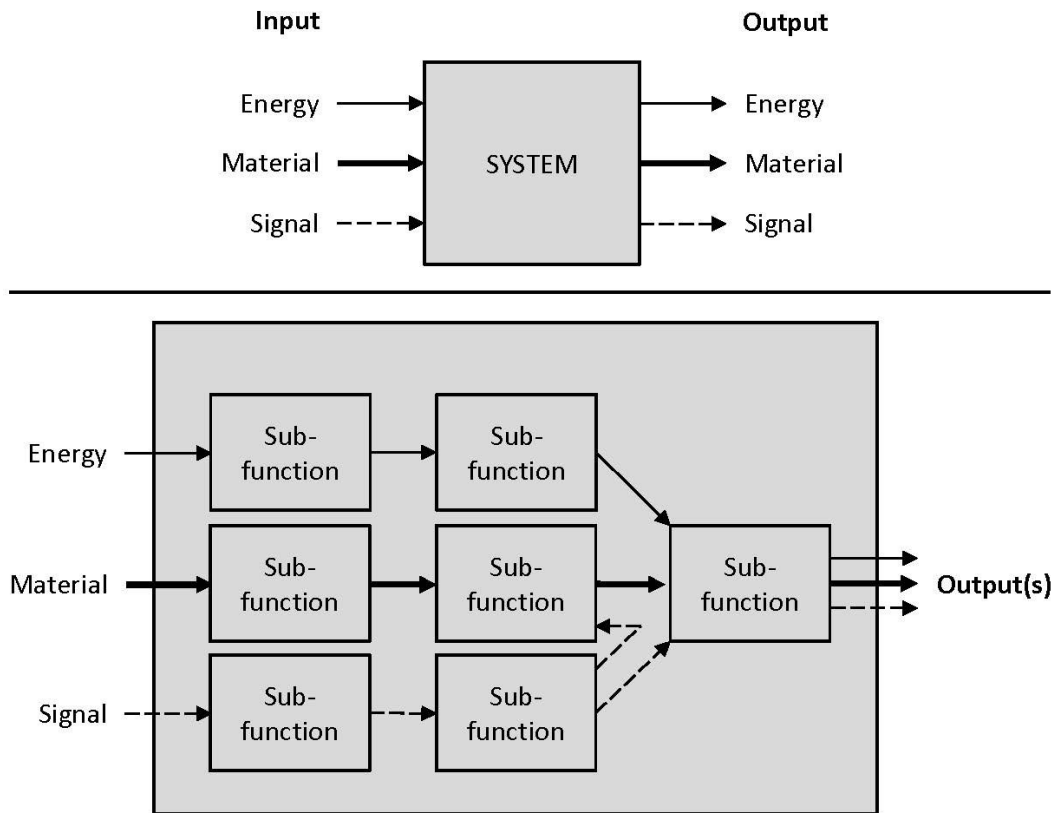

Figure 1: Function diagram example arising from functional decomposition. Figures adapted from Exhibit 7-4 from Ulrich & Eppinger's Product Design and Development.

Separating a project through functional decomposition allows for you to focus on the individual subfunctions during your concept generation and concept selection process. Your design strategy document should be prepared in such a way as to describe and justify the decomposition of your project. The design choices for each subfunction can then be discussed separately and the reader will understand what role it plays in the system.

Concept Generation and Selection

After the project has been separated into subfunctions, you will describe how you plan to approach concept generation and selection. Additionally, you should use this document to record the key concepts you generate (drawings, etc.), and the process you used to screen your concepts (Pugh matrices, etc.) This should be updated in your subsequent revisions.

Refer to the class lecture on Concept Generation and Selection for more details.

Supporting Data - Tables and Figures

Decision matrices, cost calculations, block diagrams, CAD drawings, flow charts, sketches, circuits, and graphs are essential in the design strategy document, as they help readers visualize your solution and candidate solutions. Keep in mind that simply including a table or figure is never adequate. These items must be accompanied by discussion within the text of the

document. If no comments can be made about a table or figure, then it does not add to the document and should not be included. In many cases, at least the following four items can be addressed when presenting a figure or table:

1. What is being presented?
2. Where did it come from?
3. What is significant about it?
4. How does it affect the overall topic (i.e. 'big picture') of the document?

With respect to the tables and figures themselves, effort must be made to ensure that what is being presented is done so in a way that allows the reader to easily and effectively understand the idea which you are attempting to convey. To this end, a well crafted figures comparing multiple data sets is much better than a multi-page table listing raw data values. In order or learn more about working with figures, consult **Figure and Diagram Accelerator #1: Tips for Working with Figures.**

How to revise the design strategy

The document submitted in Cycle 1 will summarize your team's initial strategy for your design based on early Concept Generation, Concept Selection, and FOSS work. The Cycle 1 submission should focus on the general methods and mechanisms which will be used to complete the subfunctions of the system.

For the revision submitted in Cycle 2, the level of detail provided for the subsystems and overall system must be increased to show exactly how each of the subfunctions will be addressed and work together.

It is expected that through work completed in Cycle 3 and 4, some details of your design strategy may change. You must account for these changes when integrating the material from your design strategy into your final report for Cycle 4.

Design Strategy Rubric