**Ethics in the Design Process**

Table of Contents

[Stages of the Design Process 3](#_Toc63379306)

[Value Conflicts 4](#_Toc63379307)

[Cost-Benefit Analysis 5](#_Toc63379308)

[Multiple-Criteria Analysis 5](#_Toc63379309)

[Thresholds 6](#_Toc63379310)

[Reasoning 6](#_Toc63379311)

[Value-Sensitive Design 6](#_Toc63379312)

The design process is how engineers take a problem, along with any additional requirements, and create a solution. We do not sit around thinking about the ethical implications of our work after we have completed it. Rather, we think about it in every single step of the design process.

When studying the ethical implications of our products, we may also need to think about a few trade-offs we have to make based on the issues we encounter. For example, if we are collecting data from users that use an application we build, at one point the amount of data we collect might be considered a breach of their privacy. The trade-off here is between the amount of privacy we are invading and the amount of useful data we are collecting. We need to decide at what point to stop. Thus, in the design of our system, we need to be innovative so as to keep things as balanced as possible.

## Stages of the Design Process

The stages of the design process are:

1. **Problem Analysis and Formulation** – Here, we describe what the problem is, taking into account any requirements.
2. **Conceptual Design** – This is the idea forming stage. We formulate different approaches to solving the problem.
3. **Simulation** – Now we have to look at how each of the suggested concepts would work with the problem, perhaps using special simulation software.
4. **Decision** – Based on the results of the simulation stage, we need to decide which concept to actually go through with. This is the most important stage, since this is where we are making ethical decisions and taking into account the social impacts of what we are planning to create.

This is a difficult stage in general, since different concepts could have different levels of effectiveness towards different goals. It can be particularly problematic, since different concepts could have different moral values associated with them as well. As with the prior example, perhaps one suggested system collects more data from users than the other in exchange for better overall performance.

1. **Detail Design** – Now we begin adding details to the chosen design.
2. **Prototype Development and Testing** – It’s what it sounds like.

## Value Conflicts

A value conflict occurs when the following conditions all occur:

* A choice has to be made between at least two options which have different moral values.
* At least two different values select different options as the best. The reason for this is that if all the values selected the same option as the best, there is no conflict.
* The values in conflict do not have differences in importance. If they do, we can simply set up an order and assign them weights, thus picking the option that gives us the highest weight. Again, this situation would mean there is no real moral conflict.

To resolve value conflicts, we will be studying five different methods – cost-benefit analysis, multiple-criteria analysis, thresholds, reasoning and value-sensitive design.

### Cost-Benefit Analysis

In this approach, we try to consider everything in terms of monetary units. This leads to some uncomfortable decisions having to be made, such as the amount of money we are willing to spend to ensure the safety of our users or to maintain the environment we are working in. The process of asking these questions is called contingent validation.

On the other hand, we also need to take into account all sorts of benefits, including things like psychological happiness.

The obvious disadvantage to this analysis method is that, not everything can accurately be measured in terms of money.

### Multiple-Criteria Analysis

In multiple-criteria analysis, we compare different options based on some criteria. These criteria include things like technological requirements, financial requirements, etc. The criteria have relative importance levels, which helps us decide on the best option.

Essentially, , where is the weight associated with the -th criteria, is the score of the -th option in the -th criteria, and is the total score of the -th option in all criteria.

In multiple-criteria analysis, we essentially have the same problem as in the cost-benefit analysis method. We are trying to measure everything in terms of certain criteria here. This is not always possible.

### Thresholds

Thresholds essentially put a minimal passing mark to each criterion that is being considered. If an option fails in even a single criterion, it will not be considered.

Things like minimum levels of safety can be ensured using thresholds.

### Reasoning

The reasoning approach is more subjective. Unlikely the other three methods which attempts to give us values based on which we can make decisions, the reasoning approach gives arguments for each option based on the values we are considering.

### Value-Sensitive Design

In value-sensitive design, we try to design new options that solve, or at the very least make easier, the value trade-offs we are faced with.

For example, in Netherlands, there was a huge problem with flooding, which resulted in the government deciding to cut off the waterflow to smaller streams in villages to prevent the flooding. However, this was met with some backlash due to environmental concerns as well as complaints by fishermen in the villages since their livelihoods were being affected. Thus, there was a conflict between safety and ecological stability. In order to solve this, a group of students proposed a surge barrier that could be closed during times where floods might occur, thus achieving the best of both available options and balancing the two moral values in conflict.

A document and a video regarding this particular case study can be found in the repository.