POLITECNICO DI MILANO





Computer Ethics

Ethical questions in the design of technology

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Important announcement!

- Tomorrow October 15
- Class discussion
  - **Physical class (15:30-16:15): room 7.0.1**
  - **Online class (16:15-17:00): Viola Schiaffonati's personal room**

Designing mediations

- In order to build in specific forms of mediation in technologies, designers need **to anticipate the future mediating role** of the **technologies** they are designing
  - **Unintentional** and **unexpected forms of mediation** (ex.: energy-saving light bulbs used in places previously left unlit and hence increasing energy consumption)
- Designers cannot simply “inscribe” a desired form of morality into an artefact, because this also depends on
  - **Users** that interpret technologies
  - **Technologies** themselves which can evoke **emergent** forms of mediation

Ethical issues in design

- **Design process** is a central area where **ethical considerations** concerning technology arise
  - Crucial decisions regarding technology are made in the design process
- Ethical questions related to technology development are **reflected** in the **design process**
  - Design process crucial for the **proper working** of a technology, **possible risks**, and **side effects**

Design process

- **Engineering design** is the activity in which certain **functions** are translated into a blueprint for an artifact, systems, or service that can fulfill these functions with the help of **knowledge**
  - Ex.: transport between two riverbanks
  - **Function** or social goal can be translated into a **technical solution** in several ways (bridge, tunnel, ferry, cable-lift)
  - Not only function but **additional design requirements** (speed of transport, costs, building time, sustainability, safety) are to be taken into account

Iteration

- Design process is an **iterative process**
  - Problem analysis and formulation, conceptual design, simulation, decision, detail design, prototype development and testing

Problem analysis and formulation

- Stage of the design process in which the designer analyzes and formulates the **design problem** and the **design requirements**
- In formulating the **design problem** a certain **perspective** may implicitly or explicitly be chosen (and this has ethical relevance)
  - Ex: design of a search engine for the Internet
  - Perspective of the company (operate properly and use to use, store information); perspective of the user (storage of search data as a violation of privacy)
- In formulating the **design requirements ethical considerations** have to be taken into account
  - Safety, health, the environment, sustainability, social consequences

Conceptual design

- Stage with the aim to generate concept design
- **Creativity** is of major importance as the virtue of being able to think out or invent new, often unexpected, options or ideas
- Is creativity a **professional virtue** and not a moral one?
  - However, it can be important to help bridge seemingly **opposed moral values**
  - Ex.: design of the storm surge barrier (Netherlands 1972) as a creative compromise to balance the two moral values of **safety** and **ecological care**

Simulation

- Stage in which the designer checks through calculations, tests, and simulations whether the **concepts designed** meet the **design requirements**
  - **Reliability of prediction** is a **methodological** issue, but **moral considerations** play a partial role in **how much** reliability in predictions is desirable or acceptable

Decision

- Stage in which **various concept designs** are **compared** with each other and a choice is made for a design that has to be detailed
- Design criteria are design requirements formulated in such a way that products meet them to a **greater** (safety, sustainability, ease of use) or **lesser** extent (costs)
- Trade off is a compromise between design criteria
  - **Different design criteria** (safety, sustainability, ease of use) have a **moral motivation**

Detail design

- Stage in which a chosen design is elaborated on and detailed
- **Ethical questions** can arise
  - Choices about **materials** to use
  - Materials differ in terms of risks, health effects, and environmental impact
  - Ex.: use of impoverished uranium as a stabilizer in airplanes that functionally is a suitable material but it is accompanied by certain health risks

Prototype development and testing

- After the design is detailed a prototype is constructed and tested
- **Test** is an **execution** of a **technology** in **circumstances** set and **controlled** by the **experimenter**, and in which data are gathered systematically about how the technology functions in practice
- Tests are **fallible** too
  - They are not always representative of the circumstances in which the product eventually has to function

Manufacture and construction

- **Ethical issues** that may arise during manufacture and construction (some can be anticipated and addressed in design)
  - **Labor conditions** (strong pressure of the market to reduce costs of production)
  - **Environment** and **sustainability**
  - Construction **safety**

Value conflicts

- When different design criteria that conflict correspond with different moral values this is a value conflict
- A value conflict arises if
  1. A **choice** is to be made between at least **two options** for which at least two values are relevant as choice criteria
  2. At least **two different values** select at least **two different options** as best
  3. The values **do not trump** each other
- Different ways in which this evaluation can take place

Example

- Alternative coolants for CFC (chlorofluoro-carbon) 12
  - How should **environmental concerns** regarding the design of new coolants for refrigerators be weighted against **safety concerns**?

Cost-benefit analysis

- Method for comparing alternatives in which all the relevant **advantages** (benefits) and **disadvantages** (costs) of the options are **expressed in monetary units** and the overall monetary cost of each alternative is calculated
- Cost-benefit analysis is more controversial if non-economic values are also relevant
  - **Contingent validation** is an approach to express values like safety and sustainability in monetary units by asking people how much they are willing to pay for a certain level of safety or sustainability
- Two or more values are **incommensurable** if they cannot be expressed or measured on a **common scale** or in terms of a **common value measure**

Thresholds

- An approach to cope with conflicting design criteria is to set a **threshold** for each **criterion**
- A threshold is the **minimal level of** a (design) **criterion** or **value** that an alternative has to meet in order to be acceptable with respect to that criterion or value
- Setting threshold occurs also in **legislation** (standardization) and in **technical codes** and **standards**
  - Minimal level of safety

Reasoning

- A non-calculative approach that aims at **clarifying the values** that underlie the conflicting design requirements and consists of three steps
  1. Identifying relevant values
  2. Specifying the values
  3. Looking for common ground among values
- The occurrence of value conflict is treated merely as a **philosophical problem** to be solved by **philosophical analysis** and **argument**

Value Sensitive Design

- An approach that aims at **integrating values** of **ethical importance** in a **systematic way** in design
- To solve value conflicts **by technical means**
  - Most values do not conflict as such but only in the light of certain technical possibilities
- Approach that aims at integrating three kinds of investigations
  - **Empirical investigations** (contexts and experiences of people affected by technological designs)
  - **Conceptual investigations** (values at stake and possible trade offs)
  - **Technical investigations** (relationship between design and values)

How to choose?

- Although alternatives score differently for various values the choice between them is **not random**
- The methods are **useful**
- Which method is best will depend on the **situation**
  - The discussion of pros and cons can help you make a choice based on **proper reasons**
  - It is good to be **aware** of the **shortcomings** of the various methods so that you can try to limit these in concrete situations

References

- Devon, R. and van de Poel, I. (2004). “Design Ethics: The Social Ethics Paradigm”. *International Journal of Engineering Education,* 20 (3), 461-469
- Van de Poel, I. and Royakkers, L. (2011). *Ethics, Technology, and Engineering*, Wiley-Blackwell