Codes of conduct

Codes of conduct: A code in which organizations (like companies or professional associations) lay down guidelines for responsible behavior of their members.

Professional code: Code of conduct hat is formulated by a professional association.

Corporate code: Code of conduct that is formulated by a company.

Aspirational code: A code that expresses the moral values of a profession or company.

Advisory codes: A code of conduct that has the objective to help individual professionals or employees to exercise moral judgments in concrete situations.

Disciplinary code: A code that has the objective to achieve that the behavior of all professionals or employees meets certain values and norms.

Professional code:

Profession Often mentioned characteristics of a profession include:

1) use of specialized knowledge and skills;

2) a monopoly on the carrying out of the occupation

3) assessment only possible by peers.

4) service orientation to society 5) ethical standards.

Integrity Living by one's own (moral) values, norms and commitments.

Honesty Telling what one has good reasons to believe to be true and disclosing all relevant information.

Conflict of interest The situation in which one has an interest (personal or professional) that, when pursued, can conflict with meeting one's professional obligations to an employer or to (other) clients.

Corporate code:

Corporate Social Responsibility The responsibility of companies towards stakeholders and to society at large that extends beyond meeting the law and serving shareholders' interests.

Mission statement Many corporate codes contain a mission statement that concisely formulates the strategic objectives of the company and answers the question what the organization stands for.

Core values: Core values express the qualities that a company considers desirable and which ground business conduct and outcomes.

Responsibility to stakeholders Most corporate codes also express responsibilities to a variety of stakeholders like consumers, employees, investors, society, and the environment.

Stakeholder principles Principles that guide the relationship between a company and its stakeholders.

Limitations:

Window-dressing Presenting a favorable impression that is not based on the actual facts

Uncritical loyalty Placing the interests of the employer, as the employer defines those interests, above any other considerations.

Critical loyalty Giving due regard to the interest of the employer, insofar as this is possible within the constraints of the employee's personal and professional ethics.

Confidentiality duties Duties on employees to keep silent certain information.

External auditing Assessing of a company in terms of its code of conduct by an external organization.

Global code:

Professional autonomy The ideal that individual professionals achieve themselves moral conclusions by reasoning clearly and carefully.

Ethical issues during design:

Engineering design The activity in which certain functions are translated nto a blueprint for an artifact, system, or service that can fulfill these functions with the help of engineering knowledge.

Design process An iterative process in which certain functions are translated into a blueprint for an artifact, system, or service. Often the following six stages are distinguished: problem analysis and formulation; conceptual design; simulation; decision; detail design; and prototype development and testing.

Problem analysis

Problem analysis stage The stage of the design process in which the designer or the design team analyses and formulates the design problem, including the design requirements.

Design requirements Requirements that a good or acceptable design has to meet.

Technical codes and standards Technical codes are legal requirements that are enforced by a governmental body to protect safety, health, and other relevant values. Technical standards are usually recommendations rather than legal requirements that are written by engineering experts in standardization committees.

Certification The process in which it is judged whether a certain technology meets the applicable technical codes and standards.

Conceptual design

Conceptual design stage The stage in which the designer or the design team generates concept designs. The focus is on an integral approach to the design problem.

Creativity The virtue of being able to think out or invent new, often unexpected, options or ideas. Creativity is an important professional virtue for designers.

Simulation

Simulation stage The stage of the design process in which the designer or the design team checks through calculations, tests, and simulations whether the concept designs meet the design requirements.

Decision

Decision stage The stage of the design process 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 A kind of design requirements which are formulated in such a way that products meet them to a greater or lesser extent. Design criteria are often used to compare and choose between different concept designs.

Trade off Compromise between design criteria. For example, you trade off a certain level of safety for a certain level of sustainability.

Organizational deviance Norms that are seen as deviant or unethical outside the organization are seen within the organization as normal and legitimate.

Detail design

Detail design stage The stage in which a chosen design is elaborated on and detailed.

Test The 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.

Tradeoffs and value conflicts

Value conflict A value conflict arises if (1) a choice has 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, and (3) the values do not trump each other.

Trumping (of values) If one value trumps another any (small) amount of the first value is worth more than any (large) amount of the second value.

Cost-benefit analysis

Cost-benefit analysis A 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 or benefit of each alternative is calculated.

Discount rate The rate that is used in cost-benefit analysis to discount future benefits (or costs). This is done because 1 dollar now is worth more than 1 dollar in 10 years time.

Contingent validation An approach to express values like safety or sustainability in monetary units by asking people how much they are willing to pay for a certain level of safety or sustainability (for example, the preservation of a piece of beautiful nature).

Multiple criteria benefit

Multiple criteria analysis A method for comparing alternatives in which various decision criteria are distinguished on basis of which the alternatives are scored. On basis of the score of each of the alternatives on the individual criteria, usually a total score is calculated for each alternative.

Threshold

Threshold 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.

Value Sensitive Design An approach that aims at integrating values of ethical importance in a systematic way in engineering design.

Regulatory framework

Regulatory framework The totality of (product-specific) rules that apply to the design and development of a technology.

Normal design Design in which the normal configuration and working principle of the product remain the same.

Radical design The opposite of normal design. Design in which either the normal configuration or the working principle (or both) of an existing product is changed.

Working principle The (scientific) principle on which the working of a product is based.

Designing morality

Technological mediation The phenomenon that when technologies fulfill their functions, they also help to shape the actions and perceptions of their users.

Mediation of perception The influence of artifacts on human perception, that is, the sensory relationship with reality.

Structure of amplification and reduction The fact that mediating technologies amplify specific aspects of (the perception of) reality while reducing other aspects.

Multistability The phenomenon that a technology can have several "stabilities," depending on the way it is embedded in a use context.

Mediation of action The influence of artifacts on human action.

Script A prescription how to act that is built (designed) into an artifact.

Invitation-inhibition structure The fact that mediating technology invited specific actions, while other actions are inhibited.

Moralization of technology The deliberate development of technologies in order to shape moral action and decision-making.

Anticipating mediation by imagination Trying to imagine the ways technology-in-design could be used. This insight is then used to deliberately shape user operations and interpretations.

Ethical aspects of technical risk

Hazard Possible damage or otherwise undesirable effect.

Risk A risk is a specification of a hazard. The most often used definition of risk is the product of the probability of an undesirable event and the effect of that event.

Safety The condition that refers to a situation in which the risks have been reduced as far as reasonably feasible and desirable.

Acceptable risk A risk that is morally acceptable. The following considerations are relevant for deciding whether a risk is morally acceptable: (1) the degree of informed consent with the risk; (2) the degree to which the benefits of a risky activity weigh up against the disadvantages and risks; (3) the availability of alternatives with a lower risk; and (4) the degree to which risks and advantages are justly distributed.

Uncertainty A lack of knowledge. Refers to situations in which we know the type of consequences, but cannot meaningfully attribute probabilities to the occurrence of such consequences

Ignorance Lack of knowledge. Refers to the situation in which we do not know what we do not know.

Ambiguity The property that different interpretations or meanings can be given to a term.

Engineer's responsibility for safety

Inherently safe design An approach to safe design that avoids hazards instead of coping with them, for example by replacing substances, mechanisms and reactions that are hazardous by less hazardous ones.

Safety factor A factor or ratio by which an installation is made safer than is needed to withstand either the expected or the maximum (expected) load.

Negative feedback mechanism A mechanism that if a device fails or an operator loses control assures that the (dangerous) device shuts down.

Multiple independent safety barriers A chain of safety barriers that operate independently of each other so that if one fails the others do not necessarily also fail.

Risk assessment A systematic investigation in which the risks of a technology of an activity are mapped and expressed quantitatively in a certain risk measure.

Failure mode Series of events that may lead to the failure of an installation.

Event tree Tree of events in which one starts with a certain event and considers what events will follow.

Fault tree Tree of events in which we move backwards from an unwanted event (a fault) to the events that could lead to the undesirable event.

Animal tests Tests for determining dose-response relationships by exposing animals to various dosages and assessing their response.

Epidemiological research Research in which population data is used to find out what the relationship is between the occurrence of certain diseases or certain mental deviations and certain factors that may cause these deviations.

Models for dose-response relationships Models that presuppose or predict a certain relationship between dose and response.

Type I error The mistake of assuming that a scientific statement is true while it actually is false. Applied to risk assessment: The mistake that one assumes a risk when there is actually no risk.

Type II error The mistake of assuming that a scientific statement is false while it actually is true. Applied to risk assessment: The mistake that one assumes that there is no risk while there actually is a risk.

Informed consent: Principle that states that activities (experiments, risks) are acceptable if people have freely consented to them after being fully informed about the (potential) risks and benefits of these activities (experiments, risks).

Risk-cost-benefit analysis This is a variant of regular cost-benefit analysis. The social costs for risk reduction are weighed against the social benefits offered by risk reduction, so achieving an optimal level of risk in which the social benefits are highest.

Best available technology As an approach to acceptable risk (or acceptable environmental emissions), best available technology refers to an approach that does not prescribe a specific technology but uses the best available technological alternative as yardstick for what is acceptable.

Personal risks Risks that only affect an individual and not a collective. For example, the risk of smoking. The relevant distinction with collective risk is whether the individual can stop or avert the risks for him or her individually. We can individually decide not to smoke but cannot individually prevent flooding for ourselves.

Collective risks Risks that affect a collective of people and not just individuals, like the risks of flooding.

Risk communicators Specialists that inform, or advise how to inform, the public about risks and hazards.

Precautionary principle Principle that prescribes how to deal with threats that are uncertain and/or cannot be scientifically established. In it most general form the precautionary principle has the following general format: If there is (1) a threat, which is (2) uncertain, then (3) some kind of action (4) is mandatory. This definition has four dimensions: (1) the threat dimension; (2) the uncertainty dimension; (3) the action dimension; and (4) the prescription dimension.
Societal experiments We speak of the introduction of new technology in society as a societal experiment if the (final) testing of possible hazards and risks of a technology and its functioning take place by the actual implementation of a technology in society.
Hypothetical consent Hypothetical consent refers to a form of informed consent in which people do not actually consent to something but are hypothetically supposed to consent if certain conditions are met, for example that it would be rational for them to consent or in their own interest.

Distribution of Responsibility

Collective responsibility The responsibility of a collective of people.
Problem of many hands The occurrence of the situation in which the collective can reasonably be held morally responsible for an outcome, while none of the individuals can be reasonably held responsible for that outcome.
Distribution of responsibility The ascription or apportioning of (individual) responsibilities to various actors.
Moral fairness requirement The requirement that a distribution of responsibility should be fair (just). In case of passive responsibility, this can be interpreted as that a person should only be held responsible if that person can be reasonably held responsible according the following conditions: wrong-doing; causal contribution; foreseeability; and freedom of action. In terms of active responsibility it can be interpreted as implying that persons should only be allocated responsibilities that they can live by.
Effectiveness requirement The moral requirement that states that responsibility should be so distributed that the distribution has the best consequences, that is, is effective in preventing harm (and in achieving positive consequences).
Liability Legal responsibility: backward-looking responsibility according to the law. Usually related to the obligation to pay a fine or repair or repay damages.
Regulation A legal tool that can forbid the development, production, or use of certain technological products, but more often it formulates a set of the boundary conditions for the design, production, and use of technologies.
Negligence Not living by certain duties. Negligence is often a main condition for legal liability. In order to show negligence for the law, usually proof must be given of a duty owed, a breach of that duty, an injury or damage, and a causal connection between the breach and the injury or damage.
Duty of care The legal obligation to adhere to a reasonable standard of care when performing any acts that could foreseeably harm others.
Strict liability A form of liability that does not require the defendant to be negligent.
Product liability Liability of manufacturers for defects in a product, without the need to proof that those manufacturers acted negligently.
Development risks In the context of product liability: Risks that could not have been foreseen given the state of scientific and technical knowledge at the time the product was put into circulation.
Corporate liability Liability of a company (corporation) when it is treated as a legal person.
Limited liability The principle that the liability of shareholders for the corporation's debts and obligations is limited to the value of their shares.
Hierarchical responsibility model The model in which only the organization's top level of personnel is held responsible for the actions of (people in) the organization.
Collective responsibility model The model in which every member of a collective body is held responsible for the actions of the other members of that same collective body (and for the responsibility of the collective).
Individual responsibility model The model in which each individual is held responsible insofar as he or she meets the conditions for individual responsibility.

Sustainability

Anthropocentrism The philosophical view that the environment has only instrumental value, that is, only value for humans and not in itself.
Biocentrism The viewpoint that the environment has intrinsic value (value of its own).
Pollution Environmental problems in which something undesirable or damaging is added to the environment.
Exhaustion A type of environmental problem in which something valuable is removed from the environment that cannot, or at least not easily, be renewed.
Non-renewable resources Natural resources that cannot be renewed or reproduced. An example is fossil fuel.
Renewable resources Natural resources that can be renewed or reproduced.
Degradation Structural damage to the environment. An example is soil erosion.
Ecological footprint A measure for the total environmental impact of a person's lifestyle expressed in an amount of space required to support this lifestyle.
Sustainable development Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland definition).
Intergenerational justice Justice that relates to the just distribution of resources between different generations.
Intragenerational justice Justice that relates to the just distribution of resources within a generation.
Property right The right to ownership of a specific matter or resource like money, land, or an environmental resource (like clean air).
Polluter pays principle The principle that damage to the environment must be repaired by the party responsible for the damage.
Stand still principle The principle that we must not pass on a poorer environment to the next generation than the one we received from the previous generation.
Environmental space The (maximum) amount of use of renewable and non-renewable resources that does not exceed the boundaries of what the environment can take.
Carrying capacity The amount of damage that can be done to the environment without that damage being irreversible.
Life phases The phases through which a product goes during its "life": production phase, use phase, and removal phase.
Life cycle analysis An analysis that maps the environmental impact of a product across the entire cycle of production, use, and disposal.
LiDS wheel approach An abbreviation for Lifecycle Design Strategies. A qualitative oriented life cycle approach.

Case Studies:

Challenger: boosters have sections joined by Orings to seal joint to contain gas. From prev launches, blowby discovered but not acted upon, treated as acceptable flight risk.
Boisjoly asked to present abt joints but only on improvement aspect and not urgency of fixing.
Boisjoly & other engineers expressed concerns, Morton Thiokol initially supported but NASA opposed delay of launch. 2nd conf call scheduled without engrs, Thiokol management recommended launch proceed.

Columbia: foam broke off from external tank, hit wing, wing broke. Engineers suspected damage was serious, wanted to check, NASA managers denied, acted without expertise.
Linda Ham - head. Engrs asked to ask Dept of Def to use imaging eqs to check for dmg, NASA mgr denied and actively tried to stop DOD from helping. Mgrs believed nothing could be done regardless.

Therac-25: reliance on software for safety, software errors on critical functions. Xray beams hit target, causing radiation overdose

Endovascular Technologies' Aortic Aneurysm Stent: device malfunctioned, did not tell FDA. FDA inspection asked for malfunction reports, only turn over a subsection

Guidant VentakPrizm Defibrillator:An embedded defibrillator that malfunctioned by wiping its own memory, becoming non-operational, in 1% of the products

DC-10: Cargo doors open outwards, need heavy locking, but can be closed without locking. AA96 accident cargo doors blown, nothing was done. TurkAir981 blown door and crash, everyone died, preventable. Dutch FAA warned, FAA and McD ignored. McD censors FMECA. Ignored test results in Long Beach. FAA did not force McD to fix doors.
AA191 accident: left wing engine broke off and severed hydraulics. Incorrect risk calculations (independent probabilities). Couldve installed slat locks, hydraulic lines placed in front of wing spar.
UAL232 Sioux City: tail engine exploded, punctured all 3 hydraulics line. Could have installed hydraulic shut off valve, JAL crash 1985 led Boeing to do this.

Hyatt Regency walkway: change of design lead to lower capacity. Lack of communication lead company to interpret sketches as final design, engrs approved design without recalculation.

Population growth: Range of predictions 7 to 12B by2050, 5.6 to 20.6B by 2100, water resources limited. land resources limited, energy consumption sharply increasing, resources non renewable

Codes and LLL: A need for continually updating your technical skills based on advancement within the profession...
Aberfan 1966: mine under village, waste rock dumped on hillside. Waste rocks turned into landslide in 1939, Powel memo issued – 6 points on tips on hills to prevent landslides. 1965 another tip slide, memo reissued, owner of aberfan mine ignored, October 1966, tip slide in aberfan, 140 people died

Oroville dam 2017: operators instructed to discharge water for flood control based on documents made in 1970, did not account for climate change or floods. 2005 dam underwent relicensing, 3 env groups raise concern emergency spillway will erode if used. FERC decided dam was compliant using wrong data from 1960s . 2017 flood, emergency spillway was used, eroded and threatened to cause damage to dam, needed a large scale evacuation.

Fukushima: backup generator flooded in 1991, tsunami studies ignored in 2000 and 2008, advice by IAEA over plant's susceptible to earthquake damage ignored. 2011, huge eq, high tsunami flooding backup generators, core meltdown. New generators placed higher was not damaged, the central switch room to route generators to cooling systems were flooded. If updated room location -> preventable

Jon's Parts

The Unmet Need is something that a customer wants and is currently not being addressed
PPC is a way to quantify the unmet need, want to be top left. Price is based upon the cost to operate the system over a 3 year period. Plot the linear regression line prior to adding your product data point
Patents are composed of 3 major sections: Abstract, Specifications & Claims.
ConOps are used to communicate how the customer wants to use your product, a reality check to see if you have covered all of the ways the a customer will use your product
Validation -The assurance that a product, service, or system meets the needs of the customer and other identified stakeholders
Verification -The evaluation of whether or not a product, service, or system complies with a regulation, requirement, specification, or imposed condition
The narrative from the ConOps and the Key Attributes makes up the left hand column of the specifications. The left hand column also defines what needs to be Validated
Specifications are comprised of two columns
–The left hand is the customer requirement
–The right hand is the engineering response and it is always measurable
A Bill of Material (BOM) is a list of the raw materials, sub-assemblies, intermediate assemblies, sub-components, parts and the quantities of each needed to manufacture an end product
A Work Breakdown Structure divides the actual project workload up into manageable work units (sub systems or blocks). A WBS is used to estimate the number of resources required to complete a task as well as the duration of the task
POC is used to mitigate risk or uncertainty of the technical challenges of your Team Project. Routine concepts may be resolved by leverage
Leverage: Does the subsystem already exist and in use?
Similitude: Scaling up or down in size, Changing environment or parameters
Analysis /Modeling: CAD modeling
Emulation: Reproduction of the function
Empirical data, Functional Prototyping
Theory of Operation: Usually, this is associated with complex systems where numerical analysis is limited or the base knowledge does not exist. In many cases, the information is Tribal Knowledge. In some cases Design of Experiments (ANOVAs) are used to characterize the system
Analysis may be required to support your technical assumptions. Innovations must be identified, quantified and the magnitude must be assessed
FMECA -is a bottom-up, inductive analytical method which may be performed at either the functional or piece-part level. FMECA extends FMEA by including a criticality analysis, which is used to chart the probability of failure modes against the severity of their consequences. The result highlights failure modes with relatively high probability and severity of consequences, allowing remedial effort to be directed where it will produce the greatest value
Non-recurring engineering (NRE) refers to the one-time cost to research, design, develop and test a new product or product enhancement