Responsibilities and how to deal with them

Engineers carry responsibilities. The creations of engineers can save or kill many people. To make sure that engineers do the right thing, they need to be aware of their responsibilities and handle them in ethically correct ways. In this chapter we will examine what kind of responsibilities there are. Also, several types of ethical codes on how to deal with responsibilities are discussed.

1 Responsibilities of engineers

1.1 What is responsibility?

Whenever something goes wrong, people always start asking who is responsible. So, let's discuss **responsibility**. In fact, the main issue that we will discuss is **moral responsibility**. Moral responsibility concerns the rightness/goodness of actions and their effects. In fact, we define **morality** as all the views, decisions and actions that people use to express what they find right/justifiable/good. It must be noted that different cultures/different groups of people adhere to different kinds of morals.

Responsibility is often linked to the role a person has. (For example, the responsibilities of an airplane pilot are different from the responsibilities of the passengers.) And, since a person often has different roles in life, he has responsibilities to different individuals/instances. Sometimes these responsibilities may be inconsistent.

1.2 Active and passive responsibility

We can distinguish two kinds of responsibility.

- **Active responsibility** is responsibility before something has happened. A person that is actively responsible is expected to act such that undesired consequences are avoided as much as possible. The chance for positive consequences must be as big as possible. When discussing active responsibility, the ideals of engineers are often important. Let's take a look at the ideals which some engineers might have.
  - Often, engineers have **technological enthusiasm**: they want to develop new technological possibilites and take up technological challenges. Technological enthusiasm is not necessarily bad. However, it can be dangerous when possible negative effects/consequences of technology are overlooked.
  - Engineers tend to strive for **effectiveness** and **efficiency**. (Effectiveness is the extent to which an established goal is achieved. Efficiency concerns the ratio between the goal achieved and the effort required.) Again, striving for effectiveness and efficiency is not necessarily bad. But it does need to be done in a morally acceptable way.
  - Finally, engineers often wish to contribute to **human well-being**. However, human well-being depends on many factors, like safety, health, welfare and sustainability. And often a choice needs to be made between these parameters: a moral optimum needs to be found. Finding this optimum isn't as easy as it may seem.
- **Passive responsibility** is applicable after something undesirable has happened. So, if you're passively responsible, you need to be able to justify your actions. To hold someone passively responsible, four conditions usually need to apply.
  - **Wrong-doing** – The individual (or institution) has violated a norm or did something wrong.

- **Causal contribution** – The individual must have made a causal contribution to the consequences for which he is held responsible. Although often multiple causal contributions have to be present: events rarely have only one cause.
- **Foreseeability** – The individual must have been able to anticipate the consequences of his actions. Although we do expect people to do as much as reasonably possible to know the consequences of one's actions. Important here is also the precautionary principle. (The **precautionary principle** states that if an action or policy has suspected risk of causing harm to the public or to the environment, in the absence of a scientific consensus that harm would not ensue, the burden of proof falls on those who would advocate taking the action.)
- **Freedom of action** – The individual must have been given the opportunity to choose for himself.

1.3 The role of engineers

Engineers are often salaried employees. They are thus hierarchically below managers. This can lead to situations of conflict. On one hand, engineers have a responsibility to their managers/their company. But on the other hand, they have a responsibility to society: the technologies that are developed should not be harmful towards the society.

A view that is often employed is the **tripartite model**. In this model, the responsibility of engineers is only confined to the technical choices that they make. So, engineers only have responsibilities towards their employers, customers and colleagues. All the decision making is done by managers, who carry the responsibilities towards society. The engineers thus separate their selves from the effects that their technologies might have on society. This is called **separatism**.

Sadly, managers don't always know the effects of technology well enough. It is therefore sometimes proposed to have engineers fulfill the role of managers. These **technocrats** use technological insight to decide what is best for the company/for society. However, **technocracy** is morally problematic, because it is **paternalistic**. (Paternalism exists when a group of people thinks that it knows better what is good for others than those others themselves do.) In a way, it denies people the right to shape their own lives.

A better way to deal with technology is to perform **technology assessments**. A technology assessment (TA) is directed at assessing the effects of technology. A **constructive technology assessment** (CTA) goes even a step further. It is directed at influencing and expanding the technological design processes. This can be done by involving the people that are effected by the technology into the design process.

2 Codes of ethics

2.1 Types of codes

Codes of conduct are codes in which organizations lay down guidelines for responsible behaviour. They are intended as an addition to the requirements of the law. For engineers, two types of codes of conduct are especially important. First, there are **professional codes** that are formulated by professional associations of engineers. Second, there are **corporate codes** that are formulated by (engineering) companies. We will go more into depth on these two types of code later in this part.

We can also split up types of codes of conduct, according to their objective. An **aspirational code** expresses the moral values of a profession/company. An **advisory code** advices professionals/employees on how to exercise moral judgments. (Most of the codes for engineers are advisory codes.) Finally, a **disciplinary code** tries to make sure that the behaviour of professionals/employees meets certain values and norms.

2.2 Professional codes

Professional codes of conduct are guidelines made by a professional society. They instruct on the exercising of a particular profession. The use of professional codes mainly started after world war 2. During the war, the image of technology was tainted. By implementing professional codes, societies of engineers hoped to restore the social image of science and technology.

Professional codes for engineers mainly express the responsibilities of engineers. This is done in three domains. First of all, engineers need to conduct their profession with integrity and honesty. Second, they have certain obligations towards employers and clients which need to be fulfilled. And finally, engineers have responsibilities towards the public and the society.

2.3 Corporate codes

Corporate codes are voluntary commitments made by (groups of) corporations. These codes of conduct set certain values, standards and principles for the conduct of the corporations. Corporate codes often consist of several main elements.

- A **mission statement** concisely formulates the strategic objectives of the company. It answers the question what the organization stands for.
- The **stakeholder statutes** state the responsibility of a company towards its stakeholders. Stakeholders include consumers, employees, investors, society and the environment.
- The **value statements** contain the core values of a company: the qualities which the company finds desirable. Often mentioned values include teamwork, responsibility, open communication and creativity.
- The **codes of conduct** contain detailed rules and norms for the behaviour of individual employees. These mainly consist of guidelines on how to act in specific situations. For example, it explains how one should deal with fraud, theft, bribery, discrimation, etcetera.

Companies often draft a corporate code to improve one's image. However, if this is the only goal of the code, then we are dealing with **window-dressing**. The danger of window-dressing is especially present in aspirational codes.

2.4 Limitations of codes

Codes of ethics have several limitations. For example, it is very hard to precisely describe what one should do in every situation. For this reason, ethical codes are often rather vague. Inconsistencies and contradictions often appear in ethical codes as well. Also, ethical codes try to describe universal moral rules. But moral rules are generally not universal.

Sometimes ethical codes are very hard to follow. This is often the case when an employee discovers certain abuses in a company. He then needs to blow the whistle. We say that **whistle blowing** is used when an employee discloses information about abuses without the consent of his superiors. When this is done within the company (but outside the usual communication channels), we speak of **internal whistle blowing**. When the information is made known to someone outside of the company, then we are dealing with **external whistle blowing**.

Whistle blowers are usually in a weak position from a legal point of view, as they disclosed confidential information of the company. However, there often are legal requirements to make certain information public. Also, engineers can argue that they have freedom of speech. Nevertheless, whistle blowers almost always do lose their jobs. For this reason, some companies have formulated policies and procedures concerning whistle blowing.

A downside of ethical codes is that it is very hard to enforce them. This is especially the case for professional codes. These codes are often only advisory, and do not have a legal status. Enforcing corporate codes is a bit easier, since corporations can dismiss engineers if they breach the code of conduct. Codes of conduct can also be enforced by external organizations or by branch organizations. This increases the credibility of the ethical code.

2.5 International codes of conduct

Companies are often spread out over several countries worldwide. These multinationals employ engineers from different cultural backgrounds. Engineering has therefore become a global activity. A global code of ethics would thus be benificial. However, developing a global code of ethics for such companies can be very difficult. The main challenge is to create consistency, in spite of cultural differences.

The **United Nations Global Compact** (UNCG) is the world's largest global code of ethics. It is made for companies that are comitted to align their operations with the ten principles of human rights, labour, environment and anti-corruption. Following these ten principles can in many ways build trust and contribute to sustainable markets.

Next to this, the United States have been a world leader in promoting engineering ethics code development. Companies from other countries are often adopting American codes of ethics. But it remains to be seen whether this will be successful, since cultural differences are now neglected.

3 Distribution of responsibility

3.1 The problem of many hands

Previously, we have considered how individuals should act. Now let's look at a group of individuals. (For example, consider a group of people designing an airplane.) Let's suppose that something goes wrong, for which the group is responsible. (For example, the airplane crashes.) Of course it is always difficult to determine in a large group/organization who did what. Pointing out a single responsible person can thus very well be nearly impossible.

But, it can also occur that every person in the group has acted in a morally justifiable way. In other words, nobody is morally responsible. This is known as the **problem of many hands**: a collective is morally responsible for some outcome, while none of the individuals can be held responsible.

The problem of many hands is often caused by an imperfect distribution of information. For example, person A knows some piece of data, which person B does not know. If person B would have known this data, the accident could have been prevented. But of course it is impossible for everyone to know everything. So, person A could not be expected to know he had to present the data to person B. As such, neither person A nor person B is responsible. But, an accident still occurred.

To solve the problem of many hands, responsibility has to be distributed among the members of the collective. An ideal distribution is both morally fair and effective. However, meeting these two requirements simultaneously is difficult. For this reason, we will examine several methods to distribute responsibility, and see how well they work.

3.2 Distributing responsibility by law

Ethics discusses moral responsibilities. The law discusses legal responsibilities. To make a distinction, we call the latter **liabilities**. One could try to make moral responsibilities and liabilities as similar as is feasible. However, it is impossible that moral responsibilities and liabilities coincide.

There are several important differences between moral responsibilities and liabilities. Whether someone is liable depends on the law. Liability is decided upon in court. Finally, being liable usually means you will have to pay some kind of fine to repay the damage that is done.

In the case of the problem of many hands, it can help to hold people liable, even if they are not morally responsible. This may make them more cautious, preventing negative effects. This is thus an effective way to solve the problem of many hands. But it is not always very fair.

According to the law, there are several ways in which a person can be liable. Let's look at a few ways.

- **Regulations** – Regulations can forbid the development/production/use of certain technological products. Although more often, regulations are used to set the boundary conditions for technologies. When a person breaches regulations, he is liable.

  The downside of using regulations is that they are based on the current knowledge of a technology. So, when new technologies are developed, regulations always lag behind.
- **Negligence** – A person can be claimed to be negligent if four conditions apply. The person must have a duty, he breaches that duty, an injury is then caused, and there is a causal connection between the breach and the injury. If this is the case, then the defendant is liable.
- **Strict liability** – In contrast to negligence, strict liability does not require the defendant to be negligent. For example, a manufacturer is liable for defects in his products, even if he did not act negligently. However, often exemptions are made for special circumstances, such as when the defects could not have been foreseen, given the state of scientific and technical knowledge.

  The advantage of strict liability is that it motivates people involved in innovation to be careful. However, strict liability can also slow down the pace of innovation significantly.
- **Corporate liability** – Just like normal persons, also corporations can be liable. The law then treats corporations as a legal person. An advantage is that you don't need to find out which individual in the company is responsible. However, corporations are often characterized by limited liability. (For example, shareholders can only be held responsible until the values of their shares.)

3.3 Responsibility in organizations

There are several models to determine who is responsible in an organization. Let's discuss the three most important ones.

- In the **hierarchical model**, those highest in the organization's hierarchy are held responsible. In practice, it can be very difficult for the executives to get hold of the right information in time. Also, it can be hard to effectively steer the behaviour of lower organisational units. So, this model is not always fair.
- In the **collective model**, every member of the organization is responsible for the actions of the whole organization. People can thus be held responsible, whether they contributed to the actions or not. This seems morally unfair. Collective responsibility is therefore only applicable in a number of exceptional cases, like in very small groups.
- In the **individual responsibility model**, each individual is held responsible for his own actions. Although this is a morally fair problem, it can lead to the problem of the many hands.

So, none of the models discussed is ideal in terms of moral fairness and effectiveness. Which model to use mostly depends on how the organization in question is organized.

Next to laws and organizations, also technology can influence responsibilities. If a person is given a task, the technology must be available such that this person can carry out this task. If not, he cannot be held responsible. For example, if an autopilot prevents pilots from intervening during cruise flight, the pilots can't be held responsible if something goes wrong during the cruise phase.