



## Practice Paper

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# ETHICAL CHALLENGES AND SUPPORT FOR ENGINEERS

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## ABSTRACT

This paper explores the ethical challenges faced by engineers in Finland, highlighting the need for stronger ethical competencies and systematic support mechanisms. A 2020 survey of TEK members revealed a lack of ethics training and identified various ethical dilemmas, including legal violations, exploitation, and other unethical practices. The TEK Working Group on Ethics proposed measures such as improving whistleblower channels, enhancing legal literacy, and fostering ethical business discussions to address these challenges. The study emphasizes the importance of integrating ethical education in engineering programs and workplace initiatives and suggests further research on the role of organisational culture in ethical decision-making.

## 1 INTRODUCTION

Ethical challenges are an inherent part of professional practice in the science, technology, engineering and mathematics (STEM) professions. These challenges can be related to decisions on technical design, organisational priorities, societal expectations, and individual responsibilities, or through complex interactions involving several of the aforementioned. Addressing such dilemmas effectively requires a solid foundation in ethical capabilities, which can be cultivated through engineering education (EE).

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## 1.1 Ethics education in Finnish Engineering Education

Development of ethical competencies in EE has been a frequent topic in discussions of developing EE in Finland over several decades: for example, TEK has published a textbook on technology ethics in 2009 (Heikkerö 2009). However, the integration of ethical competencies is still not cross-cutting in Finnish EE and when it is included, bridging the gap between abstract ethical principles and their practical application remains a persistent challenge.

This paper contributes to addressing these gaps by refining survey data on ethical challenges faced by STEM professionals into practical case examples that can be integrated into educational settings. The contents of this paper reflect the publication "Fair and Ethical Worklife" (Tekniikan akateemisten liitto, 2024) published by TEK and made by TEK Working Group on Ethics. These cases aim to provide students, as well as professionals already further in their careers, with an understanding of the ethical dilemmas that they may encounter in their careers. In addition, the paper offers actionable recommendations for developing practices and policies that proactively minimize the occurrence of these dilemmas in the future. By combining empirical insights with pedagogical innovation, this work seeks to enhance the preparedness of future professionals to navigate the ethical dimensions of their work effectively.

## 2 CONTEXT AND PRACTICAL WORK

### 2.1 TEK Working Group on Ethics

TEK is a trade union and professional organisation representing academic engineers and architects in Finland, with over 80,000 individual members that account for more than half of the workforce in the profession. Collaboration between trade unions and higher education bodies does not seem to be either common or well reported based on available literature. TEK differs from a traditional trade union in that it was formed by a fusion of a trade union and association oriented towards promoting technology, which explains its interest in technology education. For realistic engineering ethics education goals, collaboration with trade unions and other similar associations can provide vital link to the practicalities of work life.

The analysis and recommendations presented in this paper are a contribution of TEK Working Group on Ethics which was established in 2020.

TEK Working Group on Ethics works with the primary objective of promoting ethical awareness, providing practical tools for ethical decision making, and advocating for systemic improvements in organisational practices. To achieve these goals, the group engages in the following key activities:

- *Identifying Ethical Challenges:* Through surveys and other means of collaboration with TEK members, the working group collects real-world examples of ethical dilemmas encountered by TEK members.
- *Developing Practical Tools and Guidelines:* The group formulates actionable tools and guidelines to support ethical behaviour in both workplaces and educational institutions. These guidelines include recommendations for ethical development of technology, addressing discrimination, and ensuring transparency in organisational processes.

- *Raising Awareness and Advocating for Systemic Change:* The Working Group works on different types of publications to foster a culture of ethical responsibility within the engineering community. By disseminating knowledge to members who work and study in the field of technology, the aim is to empower individuals to act ethically and confidently in challenging situations.

The TEK Working Group on Ethics emphasizes the importance of proactive and collective efforts to address ethical challenges.

## 2.2 Survey on Ethical Dilemmas

This paper uses a survey-based approach to identify the ethical challenges faced by engineers in Finland. The goal was to analyse the frequency and type of real-world ethical dilemmas faced by TEK members, and also what kind of support the members would welcome in mitigating further ethical conflicts in the future (Figure 1). In addition to the results presented in more depth in this paper, the survey included questions probing issues such as if the respondent had any engineering ethics contents in their studies which was found to be very low: 70 percent of the respondents reported they received no training in ethical issues during their studies.

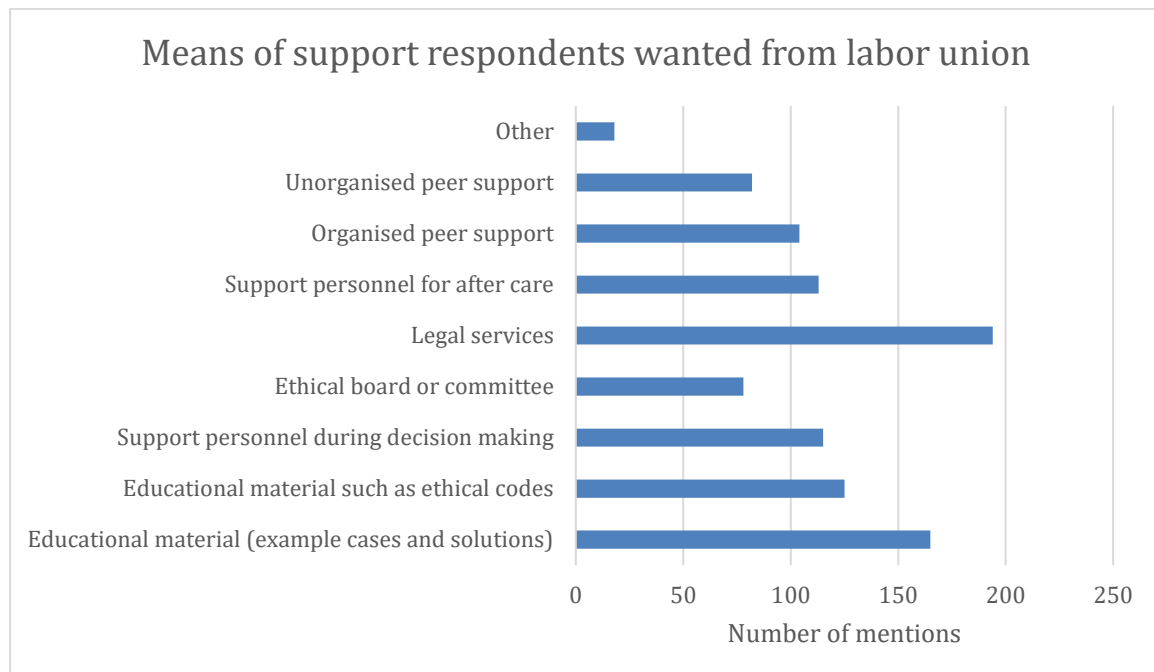


Figure 1 Respondents indicated which methods of support for dealing with ethical issues they would wish a labour union to organize. Respondents could select multiple options.

The survey was conducted in 2020 and sent via email to 6,000 members of the trade union Academic Engineers and Architects (TEK). Of these, 4,000 were actively employed, and 2,000 were retired. A total of 433 responses were received (7.2% response rate). The respondents covered a broad range of engineering fields and career stages. (Virta & Järvinen, 2021)

The survey structure is further discussed in (Virta & Järvinen, 2020), but as a summary, the questionnaire included demographic questions, questions about the ethical attitudes of the respondents, their opinions on what kind of support handling ethical issues requires and a possibility to include more detailed descriptions of ethical issues they had encountered. The responses provided more than 130 of

these descriptions. Respondents were able to assert whether they allowed further usage, such as creation of case or educational materials, based on the descriptions. Only responses that provided permission were considered for the public case examples.

### **2.3 Data processing and analysis of results**

For the scope of this paper, only the results of the open response questions regarding situations where ethical dilemmas were experienced were analysed. From the total 403 responses to the survey, 137 respondents also described their job-related ethical dilemmas in more detail in the open response. Some of the open responses were too brief or vague in their description and were not included in the further analysis. Also, as some respondents did not give permission to further process the answers they provided. In the end, a total of 103 open responses remained for further analysis.

The filtered open responses were first rephrased to ensure protection of anonymity and the phrasing of describing ethical dilemmas was harmonized. The harmonized responses were then categorized into thematic groups based on the nature of the ethical dilemmas described. The primary themes identified included conduct that is contrary to the law, exploitation of a worker's disadvantaged position, and other unethical practices. Each of these primary themes was further explored to identify possible patterns and underlying factors contributing to the dilemmas.

## **3 RESULTS AND INSIGHTS**

In the following sections, each identified primary theme is discussed in greater detail, with a focus on the contexts in which these dilemmas arose, the decisions made by respondents, and their reflections on the outcomes of those decisions.

### **3.1 Conduct Contrary to the Law**

This theme encompassed instances where respondents faced situations involving non-compliance with legal regulations. Common examples categorized by legislation included the Non-Discrimination Act and the Equality Act, the Working Time Act and the Employment Contracts Act, and the Co-Operation Act. These included instances of discrimination in recruitment processes, unequal treatment of employees based on gender, and failure to address harassment. For example, a qualified candidate was not hired due to their religious beliefs, and female employees faced harassment and unequal pay.

### **3.2 Exploitation of a Worker's Disadvantaged Position**

Employees were pressured to engage in morally questionable tasks, such as manipulating financial records or preparing dubious financial decisions under duress. Examples also included demotion of employees to benefit supervisors, exploitation of interns without proper guidance, and offering unfair employment terms to inexperienced young workers.

### **3.3 Other Unethical Practices**

This category included sub-categories business ethics, questionable subordinate behaviour, work culture and environment and legally permissible but ethically problematic operations.

### **3.3.1 Business ethics**

Employees found themselves in ethically questionable business situations, such as a company deliberately withholding information from customers about project delays or failures, despite being fully aware of them, and an employee feeling pressured to provide escort services for a client, though it was unclear whether this was explicitly demanded by the employer.

### **3.3.2 Questionable subordinate behaviour**

Though the ethical dilemmas were more commonly related to poor management, also questionable subordinate behaviour appeared in many responses. These include for example an employee attempting to blackmail their supervisor by threatening to give a poor workplace climate rating unless they received a salary increase and a worker responsible for maintaining the payroll system publicly comparing their salary to colleagues' salaries, breaching confidentiality.

### **3.3.3 Ethical Challenges Stemming from Workplace Culture or Atmosphere**

This topic included colleagues of an employee ignoring workplace safety regulations, but the employee refraining from reporting them for fear of social repercussions and reputational harm.

### **3.3.4 Legally Permissible but Ethically Problematic Actions**

Many business operations are legal but raise ethical concerns. The examples from this topic included a company engaged in business with international tobacco companies, yet no internal discussions were held about the ethical implications of such partnerships.

The data also revealed emotional and professional tolls associated with these ethical dilemmas. Many respondents described experiencing stress and struggling to reconcile their values with the demands of their roles.

## **4 CONCLUSIONS AND IMPLICATIONS**

The findings of this study highlight the wide range of ethical challenges faced by engineers in their professional lives. While some dilemmas involve clear legal violations, many fall into morally ambiguous areas where legal compliance does not necessarily equate to ethical integrity. These cases demonstrate that ethical decision-making is not always straightforward and that employees may face conflicting pressures from organisational goals, professional responsibilities, and personal values, and that employees would benefit from stronger ethical competences.

A key observation is the lack of systematic ethical training and support mechanisms available to engineers. Many respondents reported feeling uncertain about how to navigate ethical dilemmas and the demand for better guidance, such as ethical codes, peer support, and whistleblower protections, was evident in the survey results. This suggests a need for more structured ethical education in engineering programs and workplace initiatives that actively foster ethical awareness and decision-making skills.

Additionally, the results reveal that ethical challenges are not limited to isolated incidents but are often embedded in organisational culture and industry practices.

Whether it is misleading business communication, questionable financial arrangements, or workplace power dynamics, these issues are shaped by broader structural factors. Addressing them requires not only individual ethical awareness but also systemic changes in policies, leadership practices, and corporate accountability.

TEK Working Group on Ethics discussed and proposed measures to mitigate and prevent the reported ethical challenges in the future. Based on the findings on ethical dilemmas faced by TEK members, the following list of recommendations was assembled:

- *Whistleblower Channels*: Establishing and improving anonymous reporting mechanisms to protect individuals who report unethical practices.
- *Legal Literacy*: Encouraging and training to study laws to understand the legal framework of problem situations.
- *Active Intervention*: Encouraging proactive measures to address legal and ethical issues, supported by adequate resources and protection for those who take action.
- *Solidarity Obligation*: Promoting awareness of the duty to report ethical issues within the organisation, ensuring that all levels of the hierarchy are held accountable.
- *Guidelines for Fair Dismissal*: Developing and publicizing guidelines for ethical termination processes to ensure fairness, transparency and dignity.
- *Soft Landing Agreements*: Implementing agreements to support employees transitioning to retirement, recognizing their contributions and easing the transition.
- *Employee Veto Rights*: Allowing employees to anonymously raise concerns if initial solutions to ethical issues are inadequate.
- *Strengthening Leadership Skills*: Providing training for managers on ethical leadership and fair treatment of employees.
- *Setting Workplace Values*: Encouraging participation in discussing and setting the set of values of the employer, making it simpler to appeal to them when the need arises.
- *Ethical Business Discussions*: Fostering open discussions about the ethical implications of business decisions, involving employees in the decision-making process.
- *Fostering a Critical Workplace Atmosphere*: Encouraging an atmosphere where questions and dialogue are welcomed to enhance outcomes.

By integrating these strategies, organisations can cultivate a robust ethical foundation to address current challenges and proactively prevent future dilemmas. These measures highlight the importance of a systemic approach to ethics, where individual, organisational, and societal dimensions are aligned to foster a culture of ethical responsibility in STEM professions.

While these results are aimed for working life, they can be used for planning ethical education of engineers, too. The materials can be used as is, or as a basis for the teachers to create realistic examples and plan discussion topics.

The survey and its analysis also sparked ideas on further research needs. These include an in-depth analysis on the pervasiveness of ethical competences currently

provided by EE, impact of the TEK Working Group on Ethics publication in future EE and an exploration of how different engineering disciplines perceive and address ethical challenges. Additionally, future research could investigate the effectiveness of various ethical training methods in professional settings and examine the role of organisational culture in shaping ethical decision-making.

## **5 ACKNOWLEDGEMENTS**

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