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Explore the Intrinsic Value and Practical Development of Engineering Ethical Responsibility

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Abstract: Engineering ethics is an important category of ethics and engineering education research. Engineering ethical responsibility plays a more and more important role in contemporary society, which not only involves the individual behavior norms of engineers, but also relates to the development direction and social responsibility of the whole engineering industry. By analyzing the intrinsic value of engineering ethical responsibility, this paper expounds its importance to safeguard public safety, maintain social justice and promote sustainable development. Secondly, by studying the application and development trend of engineering ethical responsibility in practice, this paper reveals the requirements of engineering industry standards, laws and regulations, and organizational guidelines on engineering ethical responsibility, and analyzes the challenges and solutions in ethical practice. Through the research of this paper, we can better understand the core meaning and practical development of engineering ethical responsibility, provide guidance for engineers and relevant stakeholders, and promote the social responsibility and sustainable development of the engineering industry.

Keywords: Engineering ethical responsibility, Intrinsic value, Practice development.

1. Introduction

1.1. Research Background

Nature is the basic condition for the survival and development of human beings. Respecting, adapting to and protecting nature are the inherent requirements for comprehensively building a modern socialist country [1]. Various ecological problems and global climate change and other issues are restricting the development and progress of human civilization. Engineering disasters and ethical events in the past have triggered various environmental and ecological problems and controversies, such as the East Ohio Gas Company accident in the United States, the Chernobyl nuclear accident, and the deepwater platform explosion accident in Norway. These practices not only disturb People's Daily necessities and governments' decision-making, but also trigger people's reflection on engineering ethics, making the engineering industry pay more attention to ethical standards and responsible practices [2]. Nowadays, society is undergoing rapid changes and technological upgrading, which bring new challenges and opportunities to engineering practice. More and more new technologies are emerging, such as the Internet of Things, artificial intelligence, etc., and engineers are faced with more complex ethical choices and need to think deeply about the impact their actions may have on society and individuals.

1.2. Review of Domestic Research

Compared with European and American countries, China's research on engineering ethics started relatively late, so it generally inherited the logical thinking of European and American countries. It was not until the late 1970s that engineering ethics gradually entered the field of vision of relevant experts and scholars. The research of engineering ethics in Chinese academic circles will mainly focus on two aspects: theoretical discussion and framework construction, practical case analysis and experience summary.

On the one hand, Li Shixin systematically summarized and theoretically discussed the research methods of engineering ethics, put forward a series of engineering ethics research methods suitable for Chinese characteristics, and defined engineering ethics as the discipline and activity to guide the moral value of engineering practice, solve the moral problems in engineering and demonstrate the moral judgment related to engineering [3]. Cheng Dongfeng focuses more on the translation and analysis of Max Weber and Jonas' thought of responsibility ethics, and his book Introduction to Responsibility Ethics. Professor Li Bocong is good at interdisciplinary research, integrating theories from ethics, psychology, sociology and other fields with engineering ethics, deeply exploring the nature of engineering ethics problems and their solutions, and providing many different perspectives and methods for engineering ethics research.

On the other hand, there are also many experts and scholars who choose to reflect on and study engineers' sense of responsibility and possible ethical conflicts in practical activities from the perspective of practical case analysis and experience summary. In their book Engineering Risks and their Prevention, Xu Changshan and Zhang Yongning analyzed how to correctly understand engineering risks from the perspective of engineering philosophy, discussed the nature and origin of engineering risks and how to effectively prevent them, and put forward measures such as building a safety culture, starting from details and predicting risks in advance to actively prevent engineering risks. Professor Yu Mochang advocates that engineering ethics should be included in the research field of applied ethics, and ethical requirements and norms should be put forward in engineering practice, so as to ensure the quality of the project and safeguard the public interest [4].

1.3. Review of Foreign Research

Since the 1920s, research on engineering ethics has appeared abroad. It first emerged in North America and has since expanded to developed capitalist countries in Europe. At present, a relatively complete research field and a relatively mature research system on engineering ethics have

been formed abroad. Examples include Charles E. Harris and Michael S. Pritchard's Concepts and Cases of Engineering Ethics, and L. L. Busiarelli's Philosophy of Engineering.

Since the 1860s, the American engineering ethics community has set off a wave called "social responsibility movement", which makes engineers from behind the scenes to the front. People began to pay more attention to the responsibility of engineers and put the spotlight on them. Stephen Engel, a philosopher of technology, makes two key points: First, engineers have a responsibility to bear the consequences of their technological actions and make them public; Secondly, in order to prevent engineers from lacking moral self-restraint, relevant departments and laws and regulations need to establish effective mechanisms to ensure that the ethical responsibility of engineering is realized. Subsequently, the American Professional Engineering Association made specific provisions for engineers to pay attention to engineering ethics in the early 20th century. During this period, American scholars generally divided engineering ethics into micro and macro levels. At the micro level, it mainly studies the ethical responsibility of individual engineers. At the macro level, the research focus turns to the entire engineering community, exploring its role and ethical responsibilities in society [5].

2. Theoretical Basis of Engineering Ethical Responsibility

2.1. Overview of Ethical Theories

In traditional Chinese ethics, "Lun" refers to "class", "generation", "order" and "order". "Reason" is the truth and the rule.

Ethics has three meanings: First, to provide universal values and norms of conduct for human life; The second is to provide people with specific guidance and criteria from different angles, different fields and different levels; Third, the universal value system and the specific value system as an ideal value system model to examine, criticize, reconstruct human life, and push it to perfection.[6]

In a word, the essence of ethics is the principle that must be observed in the relationship between man and nature. Ethical theory is a systematic approach to the study of human behavior and values, aiming to explore what ethics and values are and how to deal with various ethical issues and challenges.

2.2. Concept and Definition of Engineering Ethics

Engineering ethics refers to the three values of ethics, norms and codes of conduct adopted and recognized by various engineering organizations and engineering associations to manage engineering practice, as well as the moral thoughts, moral qualities, three values and behaviors of each engineer [7]. Engineering ethics also refers to taking responsibility for social development and environmental protection through projects and making the right choice between conflicting interests and values.

The research on engineering ethics usually starts from two aspects: first, the engineer's personal moral worldview, moral consciousness and moral behavior; Second, the moral and ethical code of engineering organization [8]. At the same time, in order to better fulfill moral and ethical responsibilities in engineering practice, it is necessary to determine the priority of one's own moral behavior through moral reflection, and carefully consider and solve some important moral and ethical relations:

First, the relationship between autonomy and responsibility. While respecting individual freedom and autonomy, one must be clear about one's responsibilities to others, the collective and society [9].

Second, the relationship between efficiency and equity. While pursuing efficiency and maximizing benefits at the lowest cost, it is necessary to properly coordinate the relationship between various stakeholders, so as to realize social equity and justice.

Third, the relationship between the individual and the collective. In the process of pursuing the common benefits and social benefits of the project, the legitimate rights and interests of all stakeholders will be fully respected and protected. Conversely, engineering practices must not become obsessed with the pursuit of self-interest at the expense of the broader impact of a project on the collective and society.

Fourth, the relationship between environment and society. One of the main aspects of the project is its direct impact on the natural environment and ecological balance. In engineering practice, applying the social value of engineering, adhering to the ethical standards of environmental protection, promoting environmental protection and maintaining environmental justice are the major issues that must be faced in the construction of engineering construction [10].

In the unity of the practice of engineering and the life of the individual, the code of ethics tells the individual actor "what should be done" and "how should be behaved" in a given engineering activity at a given moment, it is the code that guides the individual participant in the engineering activity at a given moment, and links it to the thinking of the "good life".

2.3. Intrinsic Value of Engineering Ethical Responsibility

In ethics, "responsibility" is regarded as a concept that unifies morality and system, necessity and necessity, based on the fact that individuals have certain judgment and behavior ability, and take social ethics as the guiding principle and specific material and moral basis as the premise to make behavior choices. Ethical responsibility emphasizes and guides people to make choices and balance among responsibilities, rights and interests, avoiding one-sided judgments based solely on reason or sensibility. It is not only the good qualities and virtues possessed by individuals, but also the product of the combination of reason and sensibility. At the same time, ethical responsibility unifies self-discipline and heteronomy, that is, as the subject of responsibility, people are subject to double constraints from inside and outside in practice. Internal constraints are derived from the individual's own qualities and virtues, while external constraints are derived from institutions and norms [11]. The two are fused in ethical responsibility, complementing and reinforcing each other. Ethical responsibility leads people to deliberate thought and to prudent action. With the continuous development of today's social science and technology, although it has brought optimization to people's quality of life, it is also accompanied by greater production risks. Ethical responsibility helps to rationalize moral problems, so that people can predict potential crises, examine problems from the perspective of development, and take measures to avoid risks when making behavior choices, so as to choose the right road for modernization. Ethical responsibility is the perfect

integration of reason and sensibility. Under the guidance of sensibility, ethical responsibility adheres to the rational value orientation and regards the sustainable development of human beings as the highest goal. Ethical responsibility involves individuals, others, the collective and nature, and aims to imperceptibly help people establish a correct world outlook, outlook on life and values, and provide a solid guarantee for human development [12]. Ethical responsibility helps to ease the contradiction between human beings and nature. It includes nature into the category of ethical thinking, advocates human beings to correctly view the relationship between man and nature, respect the rights and values of nature, and reflect on the "subject-object dichotomy" thinking, reminding human beings to maintain the harmony and stability of nature through practical actions.

3. Research on the Intrinsic Value of Engineering Ethical Responsibility

3.1. Influence of Social Responsibility Movement on Engineering Ethics

The impact of social responsibility movement on engineering ethics lies in promoting the development and practice of ethics and social responsibility concepts in engineering practice, pushing engineers to pay more attention to the social impact of projects, public participation and transparency, and the combination of technological innovation and social value, thus promoting the sustainable development of engineering practice and social progress.

Emphasis on Social and environmental responsibility: The social responsibility movement emphasizes that businesses and professionals should consider social and environmental impacts in their decisions and actions. For the field of engineering, this means that engineers should not only focus on technical and economic feasibility, but should also consider the impact of the project on society and its environmental sustainability.

Promoting public participation and transparency: The social responsibility movement encourages businesses and professionals to engage in active dialogue and collaboration with stakeholders. In engineering, this means that engineers need to work closely with communities and stakeholders to understand their needs and concerns, ensure the legitimacy and sustainability of projects, and increase the transparency of decision-making.

Advocacy for technology assessment and risk management: The Social Responsibility movement encourages comprehensive assessment of technologies and projects, including assessment of potential risks and adverse impacts. In engineering, this means that engineers need to carry out comprehensive technical assessments in project planning and execution to identify and manage possible risks and take measures to minimize adverse effects.

Promoting the integration of technological innovation and social values: The Social Responsibility movement encourages the integration of technological innovation and social values, working to solve social and environmental problems. In the field of engineering, this means that engineers need to be committed to developing technological solutions that meet the needs and values of society and contribute to the sustainable development and progress of society.

3.2. The Relationship Between Engineering Ethics and Sustainable Development

Engineering ethics is closely related to sustainable development, because engineering activities have a wide and far-reaching impact on society, the environment and the economy. There are several links between engineering ethics and sustainable development:

Social responsibility: Engineering ethics emphasizes the social responsibility of engineers. In engineering practice, engineers should consider the impact of the project on society, including how the project meets social needs, whether it respects and protects human rights, and whether it promotes social equity and justice. Through proper planning and execution, engineering activities can bring positive impact to society and promote sustainable development of society.

Environmental protection: Sustainable development requires the protection and sustainable use of the environment, while engineering ethics requires engineers to consider the impact of the environment when designing and executing engineering projects and to take measures to minimize the negative impact on the environment. This includes efforts to reduce resource consumption, reduce energy consumption, reduce pollution emissions, etc., to ensure that engineering activities minimize the impact on the environment and leave sustainable environmental resources for future generations.

Economic benefits: Sustainable development needs to consider the long-term stability and sustainability of the economy, and engineering ethics requires that the planning and execution of engineering projects should take into account economic benefits and the impact on society. Engineers need to balance the needs of stakeholders and ensure that the economic benefits of the project are balanced with social responsibility and environmental protection to achieve long-term sustainability goals.

Public participation and transparency: Engineering ethics requires engineers to engage in active dialogue and collaboration with stakeholders, while sustainability emphasizes public participation and transparency. By working closely with communities and stakeholders, engineers can better understand their needs and concerns, ensure the legitimacy and sustainability of projects, and increase transparency in decision-making, thereby contributing to sustainable development.

Technological innovation: Engineering ethics encourages the integration of technological innovation with social values, while sustainable development requires technological innovation to solve environmental and social problems. By developing technological solutions that meet society's needs and values, engineers can drive sustainable development and positively impact society and the environment.

4. Practical Development of Engineering Ethical Responsibility

4.1. Engineering Design for Ethical Responsibility

Engineering design is the process in which engineers design the project implementation plan according to the project planning and requirements, and under the guidance of specific engineering concepts, using professional technical knowledge. The importance of engineering design is self-evident, because it directly affects the actual implementation

and results of engineering projects. In this process, the ethical values of engineers play a crucial role, which runs through the whole engineering practice. In other words, the sense of ethical responsibility of engineering designers has a profound impact on the whole engineering community and engineering practice. An engineering designer with a good sense of ethical responsibility should not only ensure the realization of the design goal, but also ensure that the means taken are legal, and fully consider the possible consequences. This sense of ethical responsibility helps to maintain the legitimacy and sustainability of engineering practices and ensure that the social, environmental and economic impacts of engineering activities are positive and sustainable.

4.2. Ethical Responsibility for Engineering Decisions

In engineering practice, engineering decision is a systematic process, including preparation, investigation and study, plan formulation and selection, in-depth study, and preparation of feasibility report. Among them, the preparation of project feasibility study report is the crucial core link. The feasibility study covers four stages: investment opportunity, preliminary feasibility, detailed feasibility and project feasibility report evaluation.

In the engineering decision-making process, decision makers, as part of the engineering community, must ensure scientific decision-making and pay attention to the participation of democratic opinions, in addition to having systematic expertise. Without the participation of democratic opinions, it may lead to authority or profit-seeking people to dominate engineering decisions, making scientific decisions a tool for their own gain, and ultimately violating the original intention of scientific decisions.

The scientificity of engineering decision is mainly manifested in two aspects: content and procedure. In terms of content, it should follow the scientific principles, technical norms, economic and sociological knowledge involved in engineering construction, and also consider the theory of human sciences. In the main body, the scientific nature of engineering decision requires the members of the community to exert their professional abilities and widely accept the correct opinions. In terms of procedures, scientific engineering decisions require a series of specific procedures, such as problem finding, solution conception, market research, resource research, technical option selection, project schedule planning, client advice solicitation, financial evaluation, economic analysis, and feasibility study planning. These comprehensive and orderly decision-making processes provide an effective guarantee for the scientificity of engineering decision-making. Genuine scientific and engineering decision-making necessarily involves democratic needs, because it inherently involves the coordination of a wide range of opinions among the members of the community. The goal of the engineering community is to safeguard the public interest, so while realizing the public interest, the members of the community should also contribute to creating a democratic and orderly social environment.

4.3. Project Implementation of Ethical Responsibility

The ethical responsibility in engineering implementation is to ensure that engineering quality, management norms and safety guarantee are paid attention to during the transformation process of engineering projects from concept to actual landing, so as to protect the public interest and life safety. This includes several main aspects:

4.3.1. Strictly Control Quality and Implement Quality Management:

(1) Project quality is related to the safety and interests of the public, so it must be strictly managed in the process of project implementation. Minor quality problems may lead to rework or increased maintenance costs, while serious quality problems may even endanger people's lives and property safety.

(2) Cultivate the concept of quality management, and make the engineering team realize that everyone has the responsibility to ensure quality through training and case analysis of major accidents.

(3) Develop quality management systems to ensure that quality management is standardized and targeted. Improve the quality assurance system, extend quality management to business, finance and other departments, and improve the level of total quality management.

4.3.2. Detail Project Management and Define the Management Contents:

(1) Implement the administrative management of the project community, including compliance with laws and regulations, performance of contracts, management of equipment, etc., to ensure the smooth progress of the project.

(2) Implementation of engineering community technical management, including drawing review, quality responsibility system, raw material inspection, etc., to ensure that the construction meets the design requirements.

(3) Implement safety production management, cultivate safety awareness, comply with safety regulations, strengthen construction site management, etc., to ensure safety in the construction process.

In every aspect, the engineering implementation team is required to strictly implement the management regulations to ensure the quality of the project, management norms and safety standards to safeguard the public interest and safety.

5. Conclusion

The importance of ethical responsibility in engineering at the social, professional and personal levels cannot be underestimated. From the social point of view, the practice of engineering ethical responsibility is directly related to the interests and well-being of the public. The decisions and actions of engineers affect the direction of society, the allocation of resources and the protection of the environment. Therefore, emphasizing and strengthening the practice of engineering ethical responsibility is essential for the sustainable development of society. At the professional level, engineering ethical responsibility is fundamental to ensuring that engineers comply with industry standards, ethical codes, and laws and regulations. Ethical compliance not only helps to ensure the quality and safety of engineering projects, but also helps to maintain the reputation and trust of the industry. By establishing a sound ethical framework and professional guidelines, engineers can be guided to help them make the right decisions in complex situations. At the individual level, ethical responsibility in engineering represents the responsibility that each engineer has for his or her profession and society. By adhering to ethical codes and regulations, engineers are able to maintain a good work ethic and enhance

their professional image and reputation. In addition, the ethics and behavior of individual engineers also have a significant impact on the cooperation and efficiency of engineering teams. This paper may deeply discuss and analyze the theoretical framework of engineering ethical responsibility, and thus provide a new idea and viewpoint for the research of engineering ethics. This paper makes an in-depth investigation and analysis on the practice of engineering ethical responsibility, puts forward feasible practical suggestions, and emphasizes its importance in the engineering industry. This provides guidance for engineering practice and encourages engineers to pay more attention to ethical responsibility.

References

[1] Bulletin of The State Council of the People's Republic of China, 2022(30):4-27.

[2] Tang Li. Theory of engineering ethics and ecological civilization construction [J]. Journal of shenyang normal university (social science edition), 2024, 13 (3): 72-78. The DOI: 10.19496 / j.carol carroll nki SSXB. 2024.03.003.

[3] Cao Meng jiao. Engineering community ethic responsibility research [D]. Nanjing forestry university, 2022. The DOI: 10.27242 /, dc nki. Gnjlu. 2020.000280.

[4] ZENG Liu-tao. Research on Engineering Risk and its Prevention from the Perspective of Responsibility Ethics [D]. Kunming University of Science and Technology, 2016.

[5] ZHANG Jinpei. Discussion on Engineering Ethics in Sustainable Design [J]. Tomorrow's Fashion, 2021(09):193-194.

[6] Li Lei, Jia Haifeng, Zhang Qian, et al. Analysis of Causes of engineering accidents from the perspective of engineering ethics [J]. Real Estate World, 2023(14):97-99. (in Chinese)

[7] Ba Zhi-Xin, Wang Jue, Li Huaguan, et al. Exploration on the model of integrating curriculum Ideological and political education with Engineering Ethics Education [J]. Journal of Higher Education, 2024, 10(04):185-188. (in Chinese) DOI:10.19980/j.CN23-1593/G4.2024.04.045.

[8] Li Lei, Jia Haifeng, Zhang Qian, et al. Analysis of Causes of engineering accidents from the perspective of engineering ethics [J]. Real Estate World, 2023(14):97-99. (in Chinese)

[9] WAN Shuquan. Ethical Integration: The realization of the whole ethics of engineering Community [J]. Journal of Luoyang Normal University, 2022, 41(09): 1-7.DOI:10.16594 / j.carol carroll nki. 41-1302 / g4.2022.09.005.

[10] Li Lifei. Research on Environmental ethical responsibility of engineers [J]. Public Standardization, 2022(09):107-109.

[11] Wan Shuquan. Ethics of consensus: the basis of the practice of engineering community as a whole ethical [J]. Journal of kunming university of science and technology (social science edition), 2021, 21 (3): 33-39. DOI: 10.16112 / j.carol carroll nki. 53-1160 / c. 2021.03.122.

[12] Pan Jianhong, Duan Jiwei. Engineering ethical responsibility and action strategy for Engineering ethical risk [J]. Journal of China University of Mining and Technology (Social Sciences Edition), 2015, 17(03):83-88.