International Journal of Recent Engineering Research and Development (IJRERD)
ISSN: 2455-8761
www.ijrerd.com || Volume 07 – Issue 03 || March 2022 || PP. 05-09

Advances in ethical research for major engineering decisions

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Abstract: The binding role of ethics on engineering decisions is becoming more and more significant, and the role and degree of influence of ethics in engineering decisions need to be urgently studied more, and a lot of research has been done by scholars related to the ethical nature of major engineering decisions. This paper mainly summarizes and describes the progress of research related to the ethics of major engineering decisions.

Key words: engineering decision making; engineering ethics; major projects; research progress

1. Introduction

As an important part of engineering ethics, the ethical issues in engineering decision making have many problems that deserve in-depth study. The correctness or incorrectness of engineering decisions, especially major engineering decisions, will not only affect the development of a region and the overall situation of engineering activities, but also the development process of the whole society, and even the future and destiny of human beings. At present, the research content of Chinese scholars is mainly divided into the following four aspects: the importance of ethics in engineering decision-making, the ethical connotation of engineering decision-making, the ethical subjects and responsibilities of engineering decision-making, and the realization of ethical evaluation of engineering decision-making, as follows.

2. Ethics in Major Engineering Decisions

2.1. A Study of the Importance of Ethics in Engineering Decision Making

Cheng Guangxu [1] pointed out that regarding the ethical issues in engineering design, decision-making, and implementation activities, insisting on an ethical standpoint is the guarantee of the correctness of engineering activities. Therefore, it is necessary to strengthen the ethical review and restraint in the engineering process. An Weifu [2] also pointed out that the core of engineering decision-making is the choice of value. Eickhoff, a famous operations researcher, believes that it is extremely dangerous for engineering decision-making models to be limited to "scientific mathematical models". He criticizes the wrong approach of ignoring decision-making value judgments and completely burying them in trivial mathematical models. Management science leads to a dead end [3]. Friedrich defined that moral responsibility in project decision-making is based on moral emotion and moral judgment. The decision-making subject perceives and evaluates the good and evil of the decision-making process and results based on specific ethical and moral norms and self-control, and then makes a judgment on their own The behavioral paradigm of negligent bearing consequences [4]. Ferrell [5] realized the importance of moral strength for ethical decision-making and considered it to be the first step in the ethical decision-making process. Engineering decision-making ethics is also the focus of foreign scholars in recent years. The research on engineering decision-making from the perspective of ethics is on the rise, and some new problems are constantly being discovered. With the in-depth study of the engineering ethics practice system, the ethical issues in engineering decision-making have gradually

become the core field. Self [6] proposed an informal reasoning method to deal with the engineering ethics problems encountered in the evaluation of the impact of engineering ethics on the moral reasoning ability, and it can also be applied to deal with the ethical problems encountered in engineering decision-making. Frey [7] discussed the important role of ethics in business decision-making, and opened up the idea of analyzing engineering decision-making from the perspective of ethics. Herkert [8] pointed out the importance of engineering ethics, including focusing on the internal relationship between individuals and the engineering profession and focusing on the collective, social responsibility and social decision-making about technology of the engineering profession. Schmidt [9] proposes an ethical framework that addresses what engineers do, how they do it, and why it matters.

2.2. Ethical implications of engineering decisions

Chen Xiang[10] believes that ethical decision-making has the scientific connotation of four aspects: human-centeredness, social justice, the supremacy of public interest, and decision-making responsibility, and explores and researches the value of ethical decision-making. Xu Shuping[11] believes that ethical decision-making refers to the process of ethical analysis, judgment and selection of decision-making solutions according to morality in a certain cultural context, so as to improve the ethicality of decision- making. Any engineering project decision making is guided by certain values, and different values influence the orientation of engineering project decision making[12].Qi Yanxia[13]et al. analyzed the moral value of engineering decision making and its ethical connotation from four dimensions: responsibility, utilitarianism, justice and ecology. Tang Li[14] et al. proposed to construct an engineering ethical decision-making system that communicates multiple dimensions from four different levels: personal, professional, organizational and social. Wang Lifei[15] proposed a project-based enterprise ethical management mechanism, which consists of two parts: the external control mechanism of enterprise ethical behavior and the internal ethical management mechanism of the enterprise. Rawls[16]'s "Theory of Justice" proposed a new dimension of inspection to judge the ethical issues in engineering activities, and the content of systems and procedures also provided valuable theoretical resources for the practice of engineering ethical decision-making. Haoqing[17] Feng in his study of nuclear engineering decision making should emphasize more on the importance of responsibility and safety dimensions. Jones[18] discovered the influencing factors of the moral decision-making process, and provided a new idea for the study of ethical issues related to engineering decision-making subjects. QinZhu[19] et al. believed that in practicing engineering ethics in a global context, adequate cultural knowledge and culturally sensitive communication skills are usually the basis for experts to make culturally sound ethical decisions. Research by Christabel [20] argues that decisions at the individual level and in the organizational environment have certain moral consequences and impacts on society.

2.3. Ethical subjects and responsibilities of engineering decision-making

Dong[21] studied the ethical responsibilities of engineering professional managers, namely engineering managers, and their measures to avoid the problem of lack of responsibility. Xiao Feng[22] emphasized the ethical responsibility of the project subject to public health, ecological environment, and social development. From the perspective of engineering ethics, decision-making subjects have the responsibility to avoid possible ethical issues before making decisions, and the public also expects engineering decision-making subjects to make correct decisions. Huang Xiaojun[23] believes that the main body of engineering ethics decision-making includes not only engineers, project managers, project stakeholders, the public, but also non-individual organizations, and analyzes the various levels of the main body of engineering ethics decision-making, which is

conducive to strengthening the ethics of engineering decision-making issues. Awareness, prevention projects bring disasters to the society and the public. Chen Wanqiu[24] revealed that the essence of major project decision-making is not a technical issue but a value issue, and proposed that the major project decision-making responsibility system must consider establishing a sense of responsibility and improving the existing responsibility system. Udo Pesch[25] also pointed out in the study that allowing the public to participate in the evaluation is more responsible for decision-making and is necessary, so it is necessary to carry out the ethical evaluation of major engineering decision-making from the social dimension.

2.4. Realization of Ethical Evaluation of Engineering Decision-Making

The realization of the ethical evaluation of engineering decision-making. Liang Jun[26] pointed out that it is not only a theoretical issue, but also a challenging practical issue to adopt ethical considerations and ethical standards in practical engineering decision-making, and to reconstruct the ethical level. Zhang Fenglin[27] proposed a quantitative evaluation model for nuclear engineering decision-making ethics from the perspective of value in terms of safety, responsibility, and justice. Miao Zehua[28] proposed to establish an ecological evaluation index system when making engineering decisions, establish a guaranteed ecological ethical behavior, and formulate an organizational structure and system for implementing ecological engineering. Cheng Xinyu[29] analyzed the ethical issues in engineering decision-making, and proposed that the establishment of an "engineering ethics committee", democratic procedures, and full consultation are the correct ways to deal with the ethical issues in engineering decision-making. Wei Yaoyao[30] analyzed the ethics of nuclear power engineering decision-making, and suggested that the ethical evaluation of its projects should be regarded as the primary link in the decision-making process. On the basis of the analysis of the risk perception of nuclear technology, Yan Kunru[31] discussed and analyzed the ethical statute of nuclear technology risk decision-making, so as to provide a theoretical basis and practical reference for nuclear technology risk decision-making, and make rational use of nuclear technology on the basis of avoiding nuclear power risks. resource. Zhou Mengling[32] discussed scientific decision-making from the aspects of theory and method application, analyzed the decision-making mechanism of nuclear power plants from a philosophical point of view, and explored the government's decision-making model in major engineering technology projects, further enriching the theory of engineering philosophy and guiding practical decision-making. MacMillan[33] believes that whether the organization provides behavioral support can also affect the individual's ethical decision-making process. Harold[34] developed a framework for ethical research and innovation, introducing new models at the intersection of ethics, strategy, and scientific and technological research to inform and explain how researchers' decisions are seen as ethical.

3. Conclusion

Buchanan, the father of public choice, believed that "the decision-making process is often more important than the decision-making outcome". Exploring the ethical evaluation issues in major engineering decision-making can make up for the deficiencies of existing research to a certain extent. Ethical issues in engineering decision-making are one of the most important components of engineering ethics and are worthy of our in-depth discussion. At this stage, domestic and foreign scholars' research on the ethical evaluation of engineering decision-making mainly focuses on decision-making ethical issues and strategies, decision-making ethical norms, and influencing factors of decision-making ethics. There are few studies in the field of engineering, and there are few quantitative models for ethical evaluation. Although some scholars have given quantitative models for engineering decision-making, there is no systematic research framework for forming an

ethical evaluation system for major engineering decisions. There are few studies on how to judge whether an engineering decision conforms to ethical demands and the extent to which it conforms to ethical demands.

4. References

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