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Analysis of Production Line Project Based on Value Sensitive Design

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ABSTRACT

Value-sensitive design is a new method to embed moral value into the design process and possesses broad research prospects. However, there is a gap between the industrial application and the practical application of VSD since its practical application focuses on human-computer interaction and medical ethics. In this paper, the conceptual, empirical, and technical investigation of VSD are analyzed, and the feasibility of VSD for production line design is demonstrated. It was applied to the production line design process in Shenyang, Liaoning Province, China. Then, specific design issues such as environmental sustainability and safety are solved by analyzing the value demands of stakeholders and balancing the value tension. Thus, the human value of the production line becomes more sensitive, and the value conflict between natural and technical artifact is alleviated. In this process, the authors reflect on the design problems to be solved and obtain valuable opinions, enabling VSD to better adapt to the industrial production line design.

KEYWORDS

Ethics, Human Value, Industrial Design, Production Line, Value Sensitive Design

INTRODUCTION

Value sensitive design is a form of design that was developed by researching human-computer interactions. By introducing attention to human values, ethical problems in technical design can be improved. The term “value sensitive design” (VSD) first appeared in a paper written by Friedman and Peter Kahn in the mid-1990s who attempted to apply human values and morality to the design of computer systems. Following its publication, two seminars funded by the National Science Foundation helped cultivate VSD research and design teams, which set the research agenda for VSD and promoted research in VSD by training relevant researchers.(Friedman & Kahn, 2008) Till now, VSD has served as an innovative design method according to innovative design in modern high-tech research and development. It takes the unpredictable risk of innovative design as the value judgment while attaching equal importance to ethics and design as a research and development path.A close coupling relationship exists between the human experience and technology or tools. Accordingly, using VSD can enable researchers, engineers and designers to participate in the early development of technology and adjust the developmental direction of technology in order to adapt to

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human development prospects. (Guihong, 2019) Integrating human values into the design process of technology breaks previous design methods in the value vacuum.Currently, VSD is mainly applied to ethical issues in information and computer technology. (Briggs & Thomas, 2015; Deng, Joshi, & Galliers, 2016; Harbers & Neerincx, 2017) The second area of application is medical ethics and nursing. (Burmeister, 2016; Kavanagh, Cimiotti, Abusalem, & Coty, 2012; van Andel, Leijten, van Delden, & van Thiel, 2015) Research on VSD in the field of engineering ethics is becoming increasingly abundant. For example, VSD is applied in wind power projects in industrialized areas in close proximity to world heritage sites. By analyzing the value conflicts of livability, economy, landscape and nature, interest conflicts among stakeholders can be reasonably solved.(van der Waal, van der Windt, Botma, & van Oost, 2020) Additionally, the moral conflict between architects and structural engineers may be remedied, resulting in more reasonable decisions being made.(Hurol, 2014) VSD can also effectively meet the design requirements of urban streets.(Osman, El-Gohary, & El-Diraby, 2007) In addition, VSD is used in industry 4.0 to build a future factory that focuses on ethics and values.(Philbeck, Davis, & Larsen, 2018; Saille, 2015)

In China, due to the increasing impact of projects, especially due to large-scale projects on the environment as well as sustainable development and environmental sustainability becoming a global topic of concern, ethical issues in engineering design have become increasingly prominent.(Bo & Yong, 2014) "Good" engineering needs good "design" as a premise and foundation, which can promote the creation of beneficial products and the virtuous cycle of the entire development process, as well as its use, maintenance and treatment. However, China's current engineering design adheres to the idea of "pollution first, treatment later".(Tao, 2010; Zhuowei, 2011) In the early stage of economic development, production growth is formed by sacrificing certain factors in environmental quality, after which it is improved by increasing the intensity of environmental regulation.(Zhiwei, 2016) Moreover, the engineering design only considers 20-30 years of use and does not consider renewal and abandonment following the end of the service cycle.(Guoqing & Tianhe, 2019) Considering that industrial output accounts for about 40% of China's GDP, and industrial engineering activities mostly serve as the main source of pollutants, it is necessary to improve and control the design in view of the source of industrial engineering projects and solve current environmental ethics dilemmas using the VSD method. However, VSD research in China is mainly carried out by technical philosophers, focusing on the level of theoretical discussion, (Baojie, 2015; Haoran & Baohua, 2020; Kunru, 2018) Therefore, it is necessary to go beyond pure theoretical research and apply VSD in guiding specific practical activities. This paper presents applying the VSD method to the design and manufacturing process of an industrial production line and analyzes why VSD theory and framework are applicable to industrial production lines. By taking the specific surface treatment production line as a case model, this paper expounds how the tripartite methodology is used in specific projects. Furthermore, semi-structured interviews are conducted with stakeholders, obtaining value conflict while adjusting value tension to solve the problem.

THEORY AND METHODOLOGY

VSD emphasizes the fluidity and organicity of the design process and is characterized by the following aspects: (1) Actively influences the design; (2) Critically analyzes the value of people in the design and engineering process; (3) Expands the scope of human value; (4) Broadens and deepens the methodology. Methods in VSD draw lessons from anthropology, design, human computer interaction, organizational research, psychology, philosophy, sociology, and software engineering.(Baojie, 2015; Friedman & Hendry, 2019) In addition, VSD advocates a portable, abstract, and unified method that can be used by different people in different situations. The formulaic VSD includes a tripartite