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Research on Risk Management of Product Development Process with Artificial Intelligence Technology

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Abstract: *In an intelligent era with informationization, artificial intelligence (AI) technology has been applied to the development and design of various products. Applying AI technology in the product development process has unique advantages. It could not only effectively enhance the process of product development and design, but also develop more creative products and improve production efficiency. However, AI technology would also face many risks during the process of product development, such as privacy and information leakage, technical risks, legal and moral risks, etc., which would limit the development of AI technology enabled products to a certain extent and bring losses to enterprises. In this paper, we discuss the value of using AI technology in product development through a preliminary introduction to AI technology and its characteristics. Risks faced in the process of AI technology product is also analyzed. Besides, we also put forward corresponding strategies to deal with the risks that arise in the development process of AI technology enabled products, so as to further optimize the development process of AI technology enabled products and enhance the efficiency of product development.*

Keywords: *artificial intelligence; product development; risk management*

1. Introduction

Promoted by a series of technologies such as the Internet, cloud computing, big data, deep neural networks, etc., artificial intelligence (AI) has been growing at an exponential rate since 2010. As a landmark event, it took the victory over former Go world champion Lee Sedol in 2016[1]. Since 2016, the application of AI technology in industry and life has been greatly speeded up. Major powers in the world have begun to attach great importance to the development of AI and have formulated corresponding development plans and strategies. The application of AI technology in product development and design could not only improve production efficiency, but also reduce the production cost to a certain extent. While AI technology has brought many advantages in the process of product development, there are also some potential risks and challenges in the application of AI technology.[2]

2. Overview of AI Technology

AI refers to the technology and system that could simulate and replicate intelligent behaviors of humans. By simulating human thinking and logic pattern, AI enables computers to have intelligent capabilities such as learning, inferring, understanding, judgment, and decision-making. AI technology has a wide range of applications, including machine learning, deep learning, natural language processing, computer vision, etc. It is gradually changing the way people live and work, and has brought many innovations and conveniences to various industries. According to a survey, investment and financing on AI in China show a growing trend in recent years. With the development of information technology and the promotion of policies, the number of investments in China's AI industry exceeded 1,000 and the amount of investment exceeded 300 billion yuan in 2021, reaching its highest value in recent years (As shown in figure 1)[3].

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Figure 1. Investment in AI industry in China

AI technology boasts the following characteristics.

First, it owns a strong learning capability. An AI system could acquire knowledge and experience through autonomous learning. Furthermore, it could utilize those knowledge and experience to improve its performance. Through learning, AI technology is able to represent and process the learned knowledge, effectively represent and process a large amount of knowledge during the production process, and utilize the knowledge to solve practical problems. In addition, an AI system could understand the natural language of humans, including semantics, syntax, and context, so as to better interact and communicate with humans.

Second, it owns a powerful data processing capability. An AI system is capable of handling data on a large scale, storing and processing a large amount of knowledge and information by building knowledge bases, knowledge graphs, etc. When needed, useful information and patterns could be extracted from those knowledge and information and corresponding decisions and predictions could be made. In practice, the AI system could handle multiple tasks and problems in concurrency to improve processing efficiency and response speed. It could also infer and deduce based on existing knowledge and rules so as to draw new conclusions and solve problems.

Third, it features automation and autonomy.[4] The AI system could make reasonable decisions based on its own knowledge and experience without direct intervention of humans. While processing information and solving problems, it could achieve automated task processing, reduce the need for human resources, and have a certain degree of autonomy in making decisions. For example, AI could obtain environmental information from sensors, cameras, and other devices. By analyzing and understanding those information, timely decisions and feedback could be made. In addition, the autonomous decision-making ability of AI is also reflected in the fact that by constructing expert systems it could simulate the knowledge and experience of human experts in a certain field so as to provide users with professional support of decision-making and related solutions.

3. Significance of Applying AI Technology in Product Development and Design

3.1 Improving Efficiency of Product Design

AI technology could automatically process a large amount of data and tasks, thus improving the efficiency of development and design. For example, by using machine learning algorithms, user needs and market trends could be analyzed, and product prototypes and design solutions could be quickly generated. As a result, the time spent on traditional manual design could be reduced. At the same time, the accuracy of AI product development and design would be higher. AI technology could predict and optimize product characteristics through model training and intelligent algorithms. By collecting and analyzing big data, AI technology could predict the needs of users more accurately and design products that could better meet users' expectations. In addition, AI technology could achieve automated collaboration and interaction to improve the efficiency of collaboration between different teams and

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roles during the product development process. For example, code generation and testing could be automatically executed by using machine learning algorithms, thus reducing developers' labor and speeding up product iteration.

3.2 Enhancing Product Innovation

AI technology could bring more innovative ideas and possibilities for product design through algorithms such as deep learning and generative models. By analyzing users' behavioral data and feedback, it could discover implied users' needs, explore new product features, and provide more design solutions. Consequentially, the product designs of enterprises could be more innovative and the style and variety of products could be enriched. Moreover, AI technology could realize the personalization of products according to the individual differences and preferences of users. By analyzing the users' historical data and behavioral patterns, personalized recommendations and suggestions could be offered so as to make the products closer to the users' preferences and meet the users' personalized needs. As a result, the expenditure on marketing could be reduced and the economic efficiency of the enterprise could be enhanced.[5]

4. Analysis of Major Risks during AI Technology Enabled Product Development Process

4.1 Existing Technical Risks

At present, AI has been widely applied in various fields in China, such as industry, finance, the Internet, retail, medical science, and education. As is shown in Fig. 2, according to data analysis, the proportion of AI applied in city management and operation in China accounted for nearly 49%, becoming an important factor and driving force in the development of the AI industry. Meanwhile, the proportion of AI applied in the Internet industry and the financial industry accounted for 18% and 12%, respectively. In summary, AI technology has been widely applied in the product design of various industries.

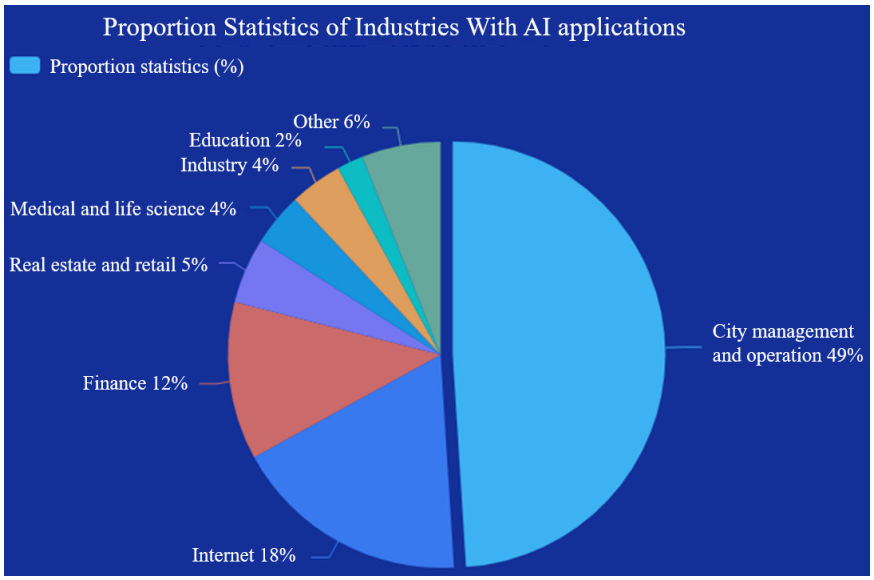

Figure 2. The proportions of AI applied in various industries[6]

While AI technology is more frequently applied, the technical risks it faced would also be elevated. AI technology itself may have uncertainty and complexity, leading to technical risks during the development process. For example, technical challenges may be encountered in algorithm design and optimization, data quality and availability, model training and validation. Therefore, a comprehensive assessment and management of technical risks is essential during the development process, including formulating plausible technical solutions, executing adequate testing and validation, etc. In addition, data quality issues would also arise during the using procedure. The training and application of AI technology require a large amount of data support. if the data quality is not high or the data set is biased, the accuracy of the model would be decreased. Inaccurate data or lacking representative data samples may trigger wrong prediction results, affecting the reliability and accuracy of the product. At the same

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time, AI models may show unstable prediction ability for unknown or abnormal situations. Moreover, if the model is only trained and tested under a specific dataset or environment without taking into account the changes and diversity of the real world, it may not be able to cope well with the complex real-world scenarios, bringing about a poor experience to an extent for users when using the corresponding products.

4.2 Existing Privacy and Security Risks

AI technology products usually require a large amount of data for training and application while such data may contain private information of users. If the privacy and security of user data are not properly protected when using AI technology in the process of product design, the risk of data leakage and infringement of users' rights and interests may be provoked, which would hurt the company's reputation and may violate relevant regulations and laws.[7]

4.3 Existing Legal and Moral Risks

The development and application of AI technology involve many issues in terms of law and ethics. The fairness and transparency of AI algorithms, the responsibility and legal liability for autonomous decision-making are difficult to define. Besides, the relevant laws and regulations need to be further improved, so in the development process, it is necessary to both formulate favorable rules and regulations and comply with the relevant laws, regulations, and ethical guidelines so as to ensure the legality and legitimacy of AI technology. In addition, the application of AI technology may bring some social and ethical risks. For example, automated decision-making may be discriminatory or biased. Meanwhile, some personal privacy could not be well protected. Moreover, it is likely that some laborers may lose their employment opportunities.[8]

4.4 Existing Commercialization Risks

There are various risks during the commercialization process of AI technology products such as market competition, profit model verification, user acceptance, etc. AI product design is closely related to users' needs. Meanwhile, the current market competition is fierce, and each enterprise is investing a lot of costs to continuously optimize AI product design, thus the commercialization risks faced by the enterprise have increased significantly. Therefore, during the process of development, it is necessary to conduct market research and formulate a commercialization strategy, assess the commercialization risk, and make timely adjustments and optimization. In addition, the development of AI technology products generally involves interdisciplinary and cross-team cooperation and requires unified project management and coordination, during which project schedule delays, insufficient resources, and teamwork problems may occur. In a word, commercialization operation is at risk.

5. Risk Management Strategies for AI Enabled Product Development Process

5.1 Strengthening Data Management and Quality Control

In the risk management of AI enabled product development and design, data management and quality control need to be further strengthened. On the one hand, the correctness, completeness, and representativeness of the dataset could be ensured by establishing a favorable data management process. On the other hand, data cleaning, preprocessing, and validation techniques could also be used to reduce errors and biases so as to improve data quality. At the same time, it is also necessary to obey relevant privacy protection regulations to ensure the security of user data.

5.2 Actively Promoting Model Evaluation and Testing

In the risk management of AI enabled product development, comprehensive model evaluation and testing are needed, including evaluating the accuracy, robustness, and interpretability of the model. Methods such as cross-validation and test set validation are used to verify the generalization ability and stability of the model, and special tests are conducted for abnormal situations. Besides, standardized model documentation is also needed so that the prediction results of the model could be subsequently understood and traced. In addition, continuous monitoring and maintenance are also effective strategies to reduce the risks faced in the process of carrying out AI enabled products. Through the establishment

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of a sound model monitoring and maintenance mechanism, the problems of the product model in practical application could be discovered and solved in a timely manner. In this way, the performance of the product design model could be continuously tracked, updated, and optimized, so as to develop and design qualified products which could better meet the needs of users.

The protection of users' personal information and privacy is one of the main risks faced in AI enabled product development. To reduce the management risk, we need to further enhance security and privacy protection. On the one hand, technical means such as encryption and secure transmission could be used to protect the security of user data. During product development and design, access control and authentication mechanisms should be designed and implemented to restrict access to sensitive data and models. Meanwhile, relevant regulations and laws should be observed to ensure compliance and user privacy protection. In addition, we need to pay attention to enhancing ethical and social responsibility as well as fully considering ethical and social impact factors during product design and development so as to avoid discriminatory, biased, and unfair issues. Moreover, we need to actively participate in the development and compliance of relevant industry standards to ensure the rational and responsible application of AI technology.

6. Conclusion

Facing the opportunities and challenges brought about by AI technology in product design, it is necessary to continuously strengthen the technical ethical norms, carry out model evaluation and testing in a timely manner, and improve the interpretability and traceability of AI technology models through the humanistic spirit of scientists. Besides, we need to strengthen the necessary support and engagement to link up all aspects during product development, so that AI technology could be effectively applied in the development and design of products. At the same time, we also need to strengthen risk managements and improve the efficiency of product production.

References

[1] Lee C S, Wang M H, Yen S J, et al. Human vs. computer go: Review and prospect [discussion forum][J]. IEEE Computational intelligence magazine, 2016, 11(3): 67-72.
[2] Aziz S, Dowling M. Machine learning and AI for risk management[J]. Disrupting finance: FinTech and strategy in the 21st century, 2019: 33-50.
[3] Yu Z, Liang Z, Xue L. A data-driven global innovation system approach and the rise of China's artificial intelligence industry[J]. Regional Studies, 2022, 56(4): 619-629.
[4] Cao L. A new age of AI: Features and futures[J]. IEEE Intelligent Systems, 2022, 37(1): 25-37.
[5] Li X, Ye P, Li J, et al. From features engineering to scenarios engineering for trustworthy AI: I&I, C&C, and V&V[J]. IEEE Intelligent Systems, 2022, 37(4): 18-26.
[6] BERDIYOROVA I, AKHTAMOVA P, GANIEV I M. Artificial intelligence in various industries[J]. DEVELOPMENT ISSUES OF INNOVATIVE ECONOMY IN THE AGRICULTURAL SECTOR, 2021: 750-757.
[7] Manheim K, Kaplan L. Artificial intelligence: Risks to privacy and democracy[J]. Yale JL & Tech., 2019, 21: 106.
[8] Volkman R, Gabriels K. AI Moral Enhancement: Upgrading the Socio-Technical System of Moral Engagement[J]. Science and Engineering Ethics, 2023, 29(2): 11.