

Research on the Influence of "Limiting Rationality" and "Limited Reliability" of Artificial Intelligence on Traditional Ethical Dilemma in Human Resource Management

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Abstract. The integration of artificial intelligence into human resource management is an irreversible trend, which is a change. However, its current black box, no human emotion and other issues directly affect the ethical issues of human resource management, and its possible super-human intelligence determines that once ethical issues occur, it will be very difficult to rely on human beings to try to save them. The purpose of this study is to explore the influence of the "infinite rationality" which breaks through the characteristics of human finiteness and the "limited reliability" of traceable responsibility on the ethical dilemma of the traditional four dimensions in human resource management. It is pointed out that the state should always be ahead of the social groups in the technological development of optimal decision-making, should legislate to promote data transparency and strengthen data supervision, should strictly restrict and control the application of technologies with obvious black box problems by social enterprises, and should rapidly develop related technologies to achieve flat management in the whole society.

Keywords: Artificial Intelligence; Limiting Rationality; Limited Reliability; Human Resource Management Ethics

1 Introduction

The development of artificial intelligence is in full swing, especially the breakthrough of the big language model has set off a new upsurge. Artificial intelligence is changing the world life at a speed visible to the naked eye, and will bring about the fourth scientific and technological revolution of mankind predictably. Wal-Mart has introduced HRTech, an artificial intelligence technology developed by BiReach, YAHOO and Salesforce. Com companies in the United States, and China has also launched HRTechChina, a comprehensive service platform for human resources science and technology (Xiao Xingzheng, 2018)^[1]. In April 2018, Hiretual 3.0, a new AI recruitment management tool of Silicon Valley Company, was launched, and YemInnovation, the first SaaS cloud platform for employee creative management in China, perfectly realized the combination of HR and BP, stimulated and managed employee creativity, and realized their creativity. So as to bring innovative profit growth for enterprises. Its new InnoCube has received national certification. As a new production tool, while we are happy with the efficiency and convenience it brings, we also need to recognize the tremendous productivity and the earth-shaking changes in production relations. In particular, the supercomputing intelligence and

black box problems of artificial intelligence machine learning are different from all previous scientific and technological revolutions. This production tool created by human beings is likely to produce a huge uncontrollable force beyond the speed of human evolution and cognition. Wu Dan et al. (2022) believe that the full integration of artificial intelligence into enterprise human resources management is the trend of the times, and the ethical problems arising from it will be incalculable^[2]. Although we can not predict his all-round impact for the time being, it is the first step we should take to study the ethical problems arising from commercial production, the starting point of the impact. Qiong Jia et al. (2018) proposed a conceptual framework for the application of artificial intelligence (AI) technology in human resource management (HRM)^[3].

AI-HR is the irreversible trend of the development of the times, and whether the powerful force of AI is controllable or not can not be inferred at present, the ethical problems it may cause should be paid attention to, if we wait for the outbreak of the problem to study, it may be because AI has surpassed human cognition at that time and can not be remedied, so we should study such problems in advance and develop AI. It seems very necessary. As a tool, AI should fully consider its double-edged sword effect, just as nuclear weapons become a time bomb affecting the survival of life physics, and AI should not be allowed to become a thinking nuclear weapon affecting the history of human cognition and life continuity.

2 Research status

In recent years, the ethical issues of artificial intelligence have received sustained attention, and in 2019, OECD member countries adopted the first AI principle signed by governments. Principles for responsible stewardship of trustworthy AI: inclusion, sustainability, and well-being; people-centered values and fairness; transparency and interpretability; robustness and security; and accountability. This has become the first intergovernmental international consensus on AI governance, establishing the concept of people-oriented development and agile and flexible governance. In the same year, China's new generation of AI governance principles were released, which put forward eight principles, namely, harmony and friendship, fairness and justice, inclusiveness and sharing, respect for privacy, security and controllability, shared responsibility, open collaboration and agile governance, in order to develop responsible AI. At the same time, there have been many studies on the ethical issues after AI is integrated into human resource management. Prasanna Tambe(2019)believes that there are four challenges in applying data science technology to human resources tasks: the complexity of human resources phenomena, the limitations imposed by small data sets, accountability issues related to fairness and other ethical and legal constraints, and the possible adverse reactions of employees to management decisions through data-based algorithms^[4].Saundarya Rajesh et al(2018)believes that Artificial Intelligence (AI) is the order of the day – there isn't a facet of life (organizational ecosystems included) that AI has not permeated^[5].However, many studies focus on the infringement of personal privacy caused by the use of data, who is dominant in human-computer integration, whether the algorithm embedded in the agent is moral, and the outbreak of employment crisis on behalf of the machine. They are all studied from the perspective of technology use, and the conclusions are either positive or negative, without in-depth discussion of the specific reasons and impact, and are often obvious and relatively easy to avoid. Few people have studied the ethical undercurrent hidden in the normal positive advantages of artificial intelligence: the impact of "infinite rationality" and "limited reliability" of traceable

responsibility derived from black-box algorithms on traditional ethical dilemmas. These ethical problems are difficult to find, but they are as powerful as the undercurrent, just like the devil dressed in angel's clothes, which deserves our awakening.

3. Definition of concept and analysis of characteristics

3.1 Human Resource Management Concept

Human resources refer to the sum of labor capacity of people within a certain range, or; It refers to the sum of intellectual and physical labor that can promote the development of the whole economy and society.

Human resource management refers to the rational allocation of human resources in a planned way according to the requirements of the development strategy of enterprises. Through a series of processes such as recruitment, training, use, assessment, incentive and adjustment of employees in enterprises, it can mobilize the enthusiasm of employees, give full play to their potential, create value for enterprises and bring benefits to enterprises. To ensure the realization of the strategic objectives of enterprises is a series of human resources policies and corresponding management activities of enterprises. These activities mainly include the formulation of enterprise human resource strategy, the recruitment and selection of employees, training and development, performance management, salary management, employee flow management, employee relationship management, and employee safety and health management. That is to say, enterprises use modern management methods to plan, organize, command, control and coordinate a series of activities in the acquisition (selection), development (education), retention (retention) and utilization (employment) of human resources, and ultimately achieve the goal of enterprise development.

3.2 The Concept and Characteristics of Artificial Intelligence Human Resource Management

Artificial intelligence human resource management (AI-HR) refers to the process of using artificial intelligence technology to optimize and improve human resource management. At present, it is mainly considered to be used for automated recruitment, automated recruitment, automated recruitment and intelligent employee relationship management, which can improve efficiency, reduce errors, intellectualize, work 24 hours a day and reduce costs.

At present, we are still in the era of weak artificial intelligence. From the perspective of human resource management, artificial intelligence mainly relies on powerful computing power and budding intelligence to liberate human resource managers from daily trivial affairs and have more time and energy to pay attention to human resource development strategy and enterprise development (Zhao Shuming et al., 2019)^[6].

These are all explicit questions floating on the sea surface, and there are deeper implicit characteristics below the sea surface: because of the unlimited computing power and massive data of AI, the advantages of high bandwidth, high speed, large memory, large storage and data traceability. It determines that AI will achieve two characteristics in the continuous development and progress: one is to break through the limit optimization choice of "bounded rationality", and the other is to solve the dilemma of unlimited responsibility and obtain limited reliability (Bao

Yongjian et al., 2018)^[7]. In the field of human resource management, it is reflected in the decision-making suggestions, on the one hand, there is a limited preference of human beings in physiology, that is, they are often satisfied with themselves, while AI is aimed at the extreme optimization of the target; On the other hand, the traditional unlimited liability often leads to the collective responsibility for the result of the collective resolution, which can not describe the responsibility that one of them should bear in the resolution, and can not be traced back, so it is easy to eventually cause no one to bear the responsibility, while the limited reliability of AI can trace the limited liability of individuals in the resolution to a certain extent.

3.3 Finiteness

Bounded Rationality is an important concept in behavioral economics and decision theory, which was proposed by Herbert Simon in 1955. This concept emphasizes the cognitive limitations and incomplete information of human beings in the decision-making process, which leads to the failure to achieve a fully rational optimal solution, but only to pursue a good enough "Satisficing" solution.

The core idea of bounded rationality is that human beings, because of their limited cognitive capacity, cannot fully consider all possible choices and consequences, nor can they access all necessary information. Therefore, in the decision-making process, people often rely on simplified decision rules, heuristic methods and rules of thumb to make decisions. Although these methods can provide satisfactory solutions in limited time, they are not always able to achieve the optimal solution.

The concept of bounded rationality has a profound impact on management. It challenges the assumption of rational man in traditional economics, that is, individuals can fully consider all choices and consequences when making decisions, and pursue the optimal solution. Bounded rationality holds that the decision-making principle of managers should be "satisfaction is enough", that is, to find and accept a good enough solution, rather than to pursue the optimal solution. This view has important implications for explaining the behavior of management decisions in the real world.

3.4 Limit rationality

Bounded rationality, one of the three cores of modern management, is being deconstructed by the explosive development of artificial intelligence. Next, it is elaborated from four aspects:

One is personal decision-making. Bounded rationality is the decision-making characteristic of natural persons, and the development of artificial intelligence and big data directly challenges this core concept. That is to say, the computing power of the machine can be pushed to the limit (that is, it can meet the optimization of the task objectives), break through the compromise logic behind the "satisfaction principle" and embody the logic of "optimization". Of course, optimization is not infinite, but is no longer subject to the cognitive limitations of the human brain, and does not need to abide by the "satisfaction" decision-making principle.

Second, system optimization. The system optimization ability of artificial intelligence also breaks the bounded rationality, and the development of any one of the five development latitudes of artificial intelligence (BRAIN, Big data, Response, Algorithm, Infrastructure, Needs) will bring the explosive ability of geometric series to the system. Let the decision support capability of artificial intelligence exceed the decision optimization needs of managers.

Third, information exchange. Machine-to-machine interaction is characterized by very large bandwidth and no information loss. Bounded rationality has an impact on the transmission of natural person's decision-making, but in the environment of machine interaction, the concept of bounded rationality has no correlation, and machines follow the law of limiting rationality.

Fourth, tacit knowledge. Bounded rationality is not only manifested in speed and capacity, but also in category. Tacit knowledge that belongs to the category of personal experience, is not presented in standardized language, and needs to be understood by practice is a typical example. The Hungarian philosopher Michael Polanyi once said, "What you can tell is less than what you know." The unspoken part is tacit knowledge. Machine interaction and transfer learning break down the barriers of tacit knowledge.

In short, with the support of AI's powerful computing power, huge capacity, machine interaction and transfer learning, the traditional assumption of bounded rationality can be constantly broken through, and individual and organizational decision-making will move towards extreme optimization rather than satisfaction.

3.5 Limited reliability

Bounded Reliability is a theoretical concept proposed by Alan Verbeke and his collaborators, which aims to explain that the reasons why people break their promises in the course of trading may not only be motivated by opportunism, but also by other factors. Traditionally, people tend to regard decision makers as self-interested opportunists, that is, their behavior is mainly motivated by the pursuit of personal interests. However, the concept of limited reliability suggests a different view, suggesting that breaches may arise from non-opportunistic motives or other causes. Although the concept of limited reliability is reasonable in theory, it has not been widely used because of the difficulty of tracing the non-opportunistic behavior of decision makers. However, with the development of artificial intelligence and block chain technology, the improvement of artificial intelligence's memory ability, computing power and algorithm, as well as the support of block chain technology, non-opportunistic activities that were difficult to trace in the past can now be quantified and analyzed, and limited reliability is becoming a concept that can be quantified and practiced. In this study, we mainly consider the traceability of quantitative analysis, that is, we can trace the responsibility and quantify it.

4. The impact of artificial intelligence on the ethical dilemma of traditional human resource management

Yan Aimin et al. (2012) studied the ethical dilemma of traditional human resource management in China, and obtained the structure of ethical dilemma on the basis of exploratory factor analysis^[8]. The study shows that the ethical dilemma of human resource management in Chinese enterprises includes four dimensions: right use, manipulation and coercion, system supervision, neglect and infringement of employee rights and interests (see Table 1 for details).

We quantify the management ethics of implementing decisions as M_0 , assume that the bounded rationality of itself is $\alpha\%$, the limiting rationality of AI is W_{AI} , and the data traceability of limited reliability is $Q_{AI}(q)$, then we can construct some models accordingly.

Table 1 Ethical Dilemmas in the Four Dimensions of Tradition

Dimension	Number	Item
Use of power		Free use of company property or private activities during working hours
	A1	Privately take the company's public goods
	A2	Pull relations in the recruitment process, leading to unfair competition
	A3	When enforcing rules and regulations, managers are not interested in people and things.
	A4	Promotion of employees is based on kinship with top management
	A5	Superiors rely on their authority to assign others to do things beyond their duties.
	A6	The company has an unfair differential pay policy.
Manipulation and coercion		Dismissal of employees without just cause
	B1	Being asked to do something contrary to one's own moral principles for the sake of the company's interests (such as dismissing old employees who have contributed to the company in order to lighten the burden of the company)
	B2	There is no justifiable reason to deduct or default on the wages of employees.
	B3	Unauthorized disclosure of employees' personal data
Institutional supervision		When unethical behavior occurs, the company will punish the relevant personnel.
	C1	Managers are ethical role models for all employees in the company.
	C2	Managers pay attention to the ethical problems that subordinates may encounter and help solve them.
	C3	When an employee is given a performance appraisal, his or her ethical performance is evaluated.
	C4	Managers conduct themselves on a daily basis consistent with the ethical values they promote
Neglect and violation of employees' rights and interests		The company intentionally conceals some information during recruitment (such as accommodation, social insurance, etc.)
		Managers verbally abuse employees
	D1	Old employees are punished because their work efficiency is affected by changes in their work.
	D2	When recruiting employees, there are specific requirements for candidates (such as gender, education, age, educational background and household registration).
	D3	Disregard of employees' career development opportunities (including lifestyle)
	D4	Managers make decisions based on personal preference in the process of recruitment, training and promotion (such as favoring a person for special treatment).
	D5	The company neglects the personal safety of employees in the working environment and production process.

4.1 Impact on decision-making

4.1.1 Ethical implications for manager-only attitudes

For C1, C2 and C4 in institutional supervision, A6 in the use of power, and D2 in the neglect and infringement of employee interests, the main impact of decision-making is the attitude of managers themselves, which is related to their own morality, without complex actions, and has

nothing to do with limited/extreme rationality, but the limited responsibility that can be traced back to history and accountability can encourage trust to promote managers to make more ethical decisions. That is, the ethical Impact 1 is the combined impact of the manager's own morality M_0 and the limited reliability $Q_{AI}(q)$, which can be modeled as follows(1):

$$\text{Impact}_1 = M_0 + Q_{AI}(q) \quad (1)$$

$Q_{AI}(q)$ is always a positive incentive, so AI plays a positive incentive role within the scope of this study, and the ethical impact of management decision-making is shown in Figure 1.

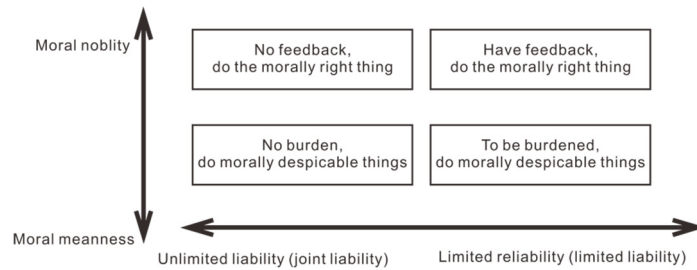


Figure 1 Decision Impact

4.1.2 Ethical implications for managerial attitudes and action strategies

For A3, A5 and A7 in the use of power, C5 and C3 in institutional supervision, B1, B2, B3 and B4 in manipulation and coercion, D1, D3, D4, D5, D6 and D7 in neglect and infringement of employees' interests, the main impact of decision-making is the attitude of managers themselves, which is related to their own morality, the need for action to solve problems, and the preference of action programs. As shown in Figure 2, when the ability of artificial intelligence exceeds that of human beings, AI limit rational algorithm makes the action proposal scheme optimize the strategy limit in order to focus on a certain goal, and its full-time and whole-process recorded big data breaks through the characteristics of human limited knowledge, which is more comprehensive and experienced, and further improves the optimization of the scheme.

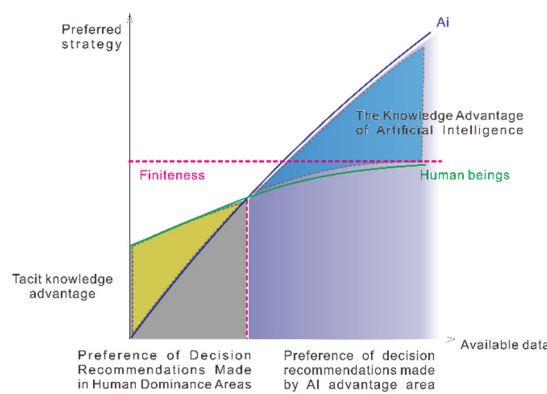


Figure 2 Preferred Advantages of Artificial Intelligence

That is to say, managers are better when morality is good, worse when it is bad, and will break through the extreme value. Good moral managers form the most just decision, while bad moral managers form the most selfish decision. Limited responsibility urges managers to make more moral decisions. That is to say, the ethical $Impact_2$ is the manager's own morality M_0 , the distance (w_{AI} , $\alpha\%$) between the artificial intelligence ability W_{AI} and the human bounded rationality $\alpha\%$, and the bounded reliability $Q_{AI}(q)$, which can be modeled as follows(2):

$$Impact_2 = M_0 \cdot \text{distance}(W_{AI}, \alpha\%) + Q_{AI}(q) \quad (2)$$

4.1.3 Ethical implications for the attitudes and action strategies of the managed

In terms of the use of power, the main influencing factors of A1, A2 and A4 are their own will at the active level and whether the behavior is discovered at the passive level. Assuming that their morality is certain, the limit of AI can greatly increase the recognition, increase the possibility of behavior being discovered, and the limited reliability also increases the possibility of being held accountable. ethics of $Impact_3$, manager's own morality M_0 , artificial intelligence capability W_{AI} and limited reliability $Q_{AI}(q)$ can be modeled as follows(3):

$$Impact_3 = M_0 + W_{AI} + Q_{AI}(q) \quad (3)$$

Therefore, AI plays a positive role in the scope of this study. The impact of management ethics is shown in Figure 3.

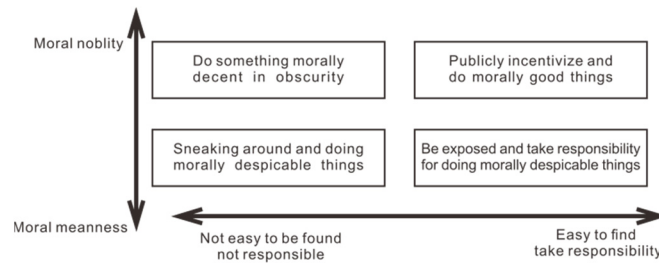


Figure 3. Ethical impact on the attitude and action strategy of the managed

4.2 Impact on the implementation process

Before the integration of AI, the execution in the traditional management mode at the branch level will be greatly influenced by people, the limitation of understanding will result in the limitation of data information transmission, and the moral situation of executives at all levels (M_1, M_2, M_n) and limited preference due to their own capabilities ($\alpha_1\%, \alpha_2\%, \alpha_n\%$) are the main factors affecting the execution. Strong morality can lead to excessive moral understanding of the intentions of superiors or discounted implementation because of the limited optimal ability of individuals. Before AI is integrated into human resource management, the Ethical $Impact_4$ can be modeled as(4):

$$Impact_4 = \sum_{i=1}^n (\alpha_i \% M_i) / n \quad (4)$$

The ethical impact of the flat management level after AI integration is θ , and the impact of human subjective factors is negligible, and θ is infinitely close to 1. Zhou Zhuohua (2020) also proposed to build a flat organizational structure to achieve "decentralized" human resources management^[9]. In the era of big data and artificial intelligence, information acquisition is faster

and more efficient, and communication among employees has broken through the traditional structured way. It highlights the instantaneous transmission of "no entropy increase" of big data. Flat management at the executive level, non-destructive and infinite transmission of data information and traceability considerations, do not contain moral color or indirectly support fair and just morality. After AI is integrated into human resource management, the Ethical Impact₅ can be modeled as (5):

$$\text{Impact}_5 = \theta (\theta \approx 1) \quad (5)$$

4.3 The overall impact on the combination of management decision-making and implementation

The above explores the impact of AI on decision-making and execution when it is integrated into human resource management, so what is the overall impact of combining the two? The next step is to make a preliminary exploratory study from two perspectives.

4.3.1 Modeling from a Mathematical Perspective

Combining decision-making with execution, before AI integration, the main ethical factors of institutional supervision are the self-morality M_0 of management decision-makers, the bounded rationality α_0 of management decision-makers, the management intensity $\gamma\%$ (that is, the impact of managers' decision-making on the decision-making of personnel at all levels, $0 \leq \gamma \leq 100$) and the moral Impact₄ at all levels of execution. The principle of finiteness results in the discount of morality (positive and negative), that is, ethics and morality mainly focus on $(-D_{\text{limit}}, D_{\text{limit}})$. That is, the Ethical Impact Before closing before AI is integrated into human resource management is (6):

$$\text{Impact}_{\text{Before closing}} = \alpha_0\% M_0 \sum_{i=1}^n (\alpha_i\% M_i) / n \quad (6)$$

After AI integration, the main ethical factors Impact_{After closing} of institutional supervision are the management decision-maker's own morality M_0 , the gap distance $(W_{\text{AI}}, \alpha\%)$ between artificial intelligence ability W_{AI} and human's limited rationality $\alpha\%$, and the limited reliability $Q_{\text{AI}}(q)$. Flattening management hierarchy executive ethics affects θ . The model is as follows (7):

$$\text{Impact}_{\text{After closing}} = \mathbf{[} M_0 \cdot \text{distance}(W_{\text{AI}}, \alpha\%) + Q_{\text{AI}}(q) \mathbf{]} \theta \approx M_0 \cdot \text{distance}(W_{\text{AI}}, \alpha\%) + Q_{\text{AI}}(q) \quad (7)$$

The infinite preference results in the increasing influence of the decision-maker's morality on the final right use ethics, that is, the moral person is more likely to produce better moral results, and the immoral person is more likely to produce worse moral results, but on the whole, the positive impact is better than the negative impact, and the set domain of ethics is expanded to $(-D_{\text{pole}}, D_{\text{pole}} + Q_{\text{AI}}(q))$, as shown in Figure 4.

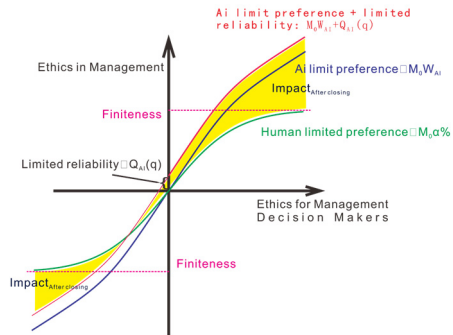


Figure 4 Modeling from a mathematical perspective

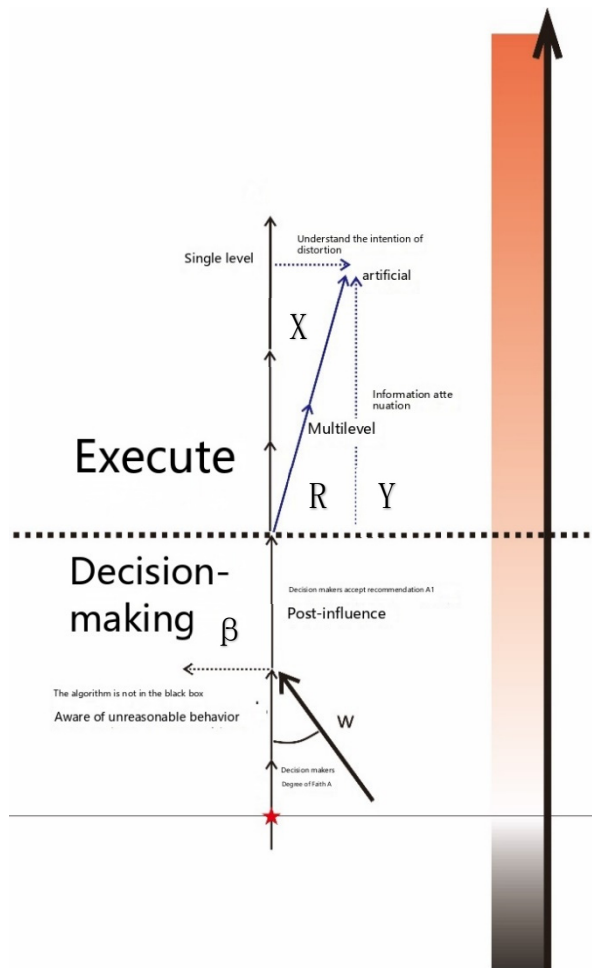


Figure 5 Modeling from a mechanical perspective

4.3.2 Modeling from the Perspective of Physical Mechanics

If we explore it from the perspective of physical mechanics, we can construct the relationship as shown in the figure.5. Assume that the initial moral quantification of a manager is vector a , and the limited ability of a natural person in the direction of decision-making ethics is vector B , which is not affected by a , so the direction is consistent with a . So after AI integration, its extreme optimization action plan should have no ethical concept, but the algorithm black box may contain unconscious immoral behavior, plus its limited reliability will allow decision makers to consider accountability issues, data traceability and comprehensive monitoring will allow decision makers to consider exposure issues, so decision makers have a certain degree of AI. Set the angle between the force vector w of AI and the direction of a as α , and set the morality inconsistent with the direction of a as β .

Entering the executive layer, the vector force AI of artificial intelligence is decentralized, the overall interaction of data does not change in the direction of force, and the limit is lossless, while the artificial vector force R , due to the loss of information and the limitation of personal knowledge, will make the force attenuation set as vector force y , at the same time. It is easy to distort and misunderstand the implementation intention, degree and moral tendency of decision-making, which is set as vector force X .

4.3.3 Suggestions after comprehensive research and judgment

To sum up, combined with the exploration and research from two perspectives, it is suggested that we should focus on the development of flat management and comprehensive data interaction technology, while the government should give priority to the construction of traceability supervision ability of data, that is, to enhance the limited reliability, and to increase the moral fear of management decision makers through legislation and other means. In this direction, the overall development speed or the speed of integrating human resources should be first and stronger than the ability of intelligent optimization to select strategies.

5 Conclusions and recommendations

In the era of big data, the "extreme rationality" of artificial intelligence constantly impacts the "bounded rationality" of human resources management, and the ethical dilemma of the traditional four dimensions is also affected and changed. In view of the development scenario of AI beyond human cognition, in order to actively avoid the possible technological alienation in the process of AI's integration into the field of human resources management, and to prevent the "black box" problems caused by disorderly integration from being difficult to find and intervene. This paper makes a preliminary exploration of the influence mechanism, and generally believes that its extreme rationality is a double-edged sword, which breaks the ethical discount of traditional bounded rationality and leads to better or worse; data traceability positively promotes human resource ethics. The size of the large database, the condition setting of AI optimization, the decision-maker's own ethics and the degree of fear of punishment for violations of ethics and morality are all the main factors.

In the process of integrating AI into human resource management, we should give priority to the development of data traceability to enhance the ability of supervision and accountability, vigorously develop the ability of data transmission and interoperability to achieve flat

management as soon as possible, prohibit private research and development of AI with significant unexplainable black box ratio to prevent ethical runaway, and promote the integration of AI into human resource management. At the national level, we should always maintain absolute advantages over local enterprises in terms of data traceability, collection and mining capabilities, and at the same time, we should strictly manage according to law in terms of punishing ethical violations and reasonably improving the transparency of relevant data, so as to maintain absolute deterrence.

6 Deficiencies and the next step

This paper is based on the literature research, mainly through logical reasoning, forward-looking qualitative exploration and analysis of possible future problems, although in order to better understand and judge, try to borrow mathematical and physical knowledge, carry out some quantification, but the quantitative methods and data are not accurate enough, the actual role needs to be further verified. It also greatly limits the practical contribution to the current research on human resource management related to artificial intelligence. This paper focuses on the four dimensions of ethical dilemmas of traditional human resources, which still has some limitations. In the process of integrating AI into human resources management, it will certainly break the tradition, or even change the runway, which will lead to new ethical dilemmas, which should be the focus of further research.

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