Research on Leadership Measurement Tool Based on Trust

Miaoting Chen, Jingjing Wang, Fang Ruan
Wuhan University of Technology, Wuhan 430070, China.

Abstract: This study defines the new concept of "algorithmic leadership", expounds its core concepts, studies its framework,and verifies the correctness of its framework construction. In this process, the measurement tool of algorithmic leadership is constructed, and the relationship between algorithmic leadership and its subordinates is discussed, so as to improve the current leadership theory and promote the development of leadership theory. We will strengthen leadership and management.

Keywords: Algorithm; Leadership; Degree of Trust; Model Construction

1. Research background

Leadership refers to the ability to make full use of human resources and objective conditions within the jurisdiction to accomplish the required things at minimum cost and improve the efficiency of the whole group. The rapid development of data science artificial intelligence in recent years has endowed algorithms with new connotations. Intelligent algorithms are no longer autonomous formulas that are calculated based on statistical models or decision rules as previously thought. At present, intelligent algorithms do not rely on designer restrictions and learn from historical data by themselves, or without data, they train themselves to form their own logical link and find new decision-making patterns. Just like Alpha go, which defeated the great human chess player, and these decision-making modes may not even be known by the programmer, in some enterprises, intelligent algorithms can also replace the work of the previous management, such as employee management, employee supervision, performance appraisal and so on. This aspect reflects that the algorithm can bear the work of the management to a certain extent. In the era of vigorous development of artificial intelligence, people have realized whether algorithms can also have leadership and participate in the management of enterprises like people.

2. Algorithmic Leadership

2.1 Definition

The study of algorithmic leadership is still a relatively emerging field for domestic and foreign scholars, but digital leadership similar to algorithmic leadership has been widely mentioned by domestic and foreign scholars. Foreign scholars Frank van Outvorst, Cinty Visker and Benny De Waal proposed: IT takes over, facilitating or urging the organization to transition to a new business model. The call for digital leadership is becoming more urgent; Domestic scholars Han Li and Cheng Yunxi put forward that: at present, digital transformation has become the core proposition of enterprise survival, and it has become crucial to enhance digital leadership and build enterprise "moat" advantage.

It can be seen from the above that "digital leadership" has attracted the attention of scholars at home and abroad, and the academic circle has not yet had a clear definition of the new concept of algorithmic leadership. Here, through comprehensive analysis and concise extraction of domestic and foreign literature, algorithmic leadership is defined as that leading cadres take algorithm as an important leadership content and method. The algorithm is used to guide, command, organize, coordinate, supervise and educate the employees, so as to improve the operation efficiency of the enterprise. In combination with the multiple leadership functions of the current intelligent algorithm, the leadership power is given to the algorithm, which replaces the management at different levels and engages in various work of discretion, so that the algorithm can become a leader, make full use of human resources and objective

conditions to accomplish the required things at minimum cost, improve the efficiency of the whole group, realize the vision of the organization, and stimulate the morale of the employees. Realize corporate social responsibility.

2.2 Model overview

The iceberg model provides a new perspective and a more favorable tool for the practice of human resource management, so we use the iceberg model to grade the algorithmic leadership model. The iceberg model divides the algorithm leadership model into five levels, which are independent iteration upgrade, high decision accuracy rate, interaction ability, trust, and employee affinity. The independent iteration upgrade and high decision accuracy rate are above the surface of the iceberg, while the rest are hidden below the surface. Since trust is also below the surface of the ice, it is not a dominant trait, so we focus on the level of trust to explore the measurement of algorithmic leadership.

Table 1 Level of algorithm leadership model under Iceberg model

Category	Variable	Definition
Dominant Factors	Autonomous iterative upgrade	Internal automatic upgrade optimization, complete iterative update
	Higher decision accuracy	According to the enterprise business needs to make decisions, there is a high accuracy
	Interactive capability	As a leader, I need to communicate and interact with multiple parties, and I need to have strong interactive ability to realize efficient information transmission
Recessive Factors	Trust degree	A leader who is honest, trustworthy, and has integrity is a leader whose subordinates trust him
	Employee affinity	A good leader needs to give his subordinates humanistic care

3. Rearch Method

3.1 Literature review method

Literature review for short, also known as literature review, literature analysis. It is to collect a large amount of relevant information about the subject, problem or research topic in a certain field, a certain profession or a certain aspect, and then make a comprehensive introduction and elaboration by reading, analyzing, summarizing and sorting out the latest progress, academic opinions or suggestions of the current topic, problem or research topic.

By reading Chinese and foreign literature and searching keywords such as algorithm, leadership, algorithmic leadership, digital leadership, and trust, the core concepts are condensed and relevant characteristics are summarized. Based on the characteristics of the current algorithm, the author judges whether the algorithm has leadership from the level of trust.

3.2 Case analysis

Case analysis method, also known as case analysis method or typical analysis method, is a scientific analysis method that conducts thorough and careful research on representative things (phenomena) in order to obtain the overall understanding. Case analysis method has the characteristics of representativeness, systematism, profoundness and concreteness. UBER, the foreign answer to Didi Chuxing, uses powerful artificial intelligence algorithms that process customer ride requests and assign them to drivers using the system based on their availability and location. It then monitors the requests the driver accepts and assesses the customer's rating. Based on the accumulated information, the system provides drivers with feedback on how to improve the customer's driving experience, adjusts driving fares or suspectdrivers with bad customer ratings. In addition, the system asks drivers about future work days and hours, and incentivizes them to work on certain dates to meet the demand for Uber drivers from riders in each region. Uber algorithm system has realized a number of leadership functions such as task allocation, shift planning, performance feedback and compensation. Customers also believe in the superiority of algorithm matching and have a high degree of trust in Uber algorithm, which can be considered as leadership to a certain extent.

3.3 Questionnaire survey method

Firstly, based on the survey objects and research content, questions were designed, questionnaires were set up for the control group, network questionnaires were distributed, data were collected, and data of the blank control group and experimental group were compared and analyzed to find out the factors affecting the algorithm trust, so as to establish an accurate algorithm leadership model.

Questionnaire survey is an operable method to construct an algorithm leadership measurement tool. Among them, network questionnaire has advantages that traditional survey methods do not have. The convenience, interactivity and timeliness of network questionnaire are also beneficial to this study. Therefore, this paper adopts the questionnaire survey method to build a tool to measure the leadership of the algorithm with trust as the starting point.

4. Rearch Process

4.1 Questionnaire design

For the research on the measurement of the trust degree of algorithm leadership, we start from the questionnaire survey, take college students with high acceptance as the survey objects, set up the AB control group questionnaire, explore people's trust degree of people and trust degree of algorithm, discuss the causes and influencing factors of such trust bias, and study whether the algorithm has leadership from the perspective of trust degree.

According to the characteristics of the survey subjects, we simulated the situations that might occur in the environment of the survey subjects. In different situations, people and the algorithm gave suggestions respectively, and then adopted 5-point Likert scale for measurement. The options from high to low were set for the survey subjects to choose. Two questions will appear repeatedly in each questionnaire, and the validity of the questionnaire will be verified by judging whether the answers to the same questions are consistent.

After the simulation scenario, we designed the following two groups of questionnaires: the attitude research questionnaire about trust in different campus situations and the attitude research questionnaire about algorithm application in different campus situations. The first group of questionnaires takes people as the subject of suggestions, gives some suggestions to the respondents in a specific situation, and analyzes their trust in people according to the choices of the respondents. The second group of questionnaires takes the algorithm as the main body of suggestions, and gives some suggestions to the respondents in a specific situation to analyze their trust in the algorithm according to their choice. The comparison between the two groups is used to analyze and judge whether the algorithm has enough trust, so as to reach the level of leadership decision.

4.2 Data analysis

Clean up the questionnaire data, eliminate invalid questionnaires and sort out valid questionnaires according to the verification questions set in the questionnaire. The questionnaire data of the blank control group and the data of the experimental group were sorted out respectively according to the needs, and then the two groups of data were sorted into a table for comparative analysis.

SPSS Statics26 was used to analyze the data obtained, and mean comparison, single sample T test and paired sample T test were conducted for the processed data.

Result analysis

We numbered the options 1-5 for each question in the questionnaire, with 1 indicating a high degree of trust and 5 indicating a low degree of trust. The options were converted into numbers for analysis.

From the comparison of the mean value of the blank control group, it can be found that the mean value of most questions is below 3, indicating a high degree of trust. The mean value of the experimental group was also mostly below 3, but the distribution was different from that of the blank control group. In addition, sig of about half of the questions in both groups was less than 0.05, indicating that the variables of about half of the questions were significantly different from the test value. sig values of question 7 and question 11 of the two groups showed significant differences, indicating that the attitudes of questionnaire subjects towards people and algorithms showed significant differences in these two questions.

The paired sample T test was carried out on the two groups of data, and the number of questionnaire cases in both groups was 351. There was little difference between their mean value and standard deviation. The mean value of standard error was 0.080, which indicated that there was little deviation from the mean value.

Table 2 Statistics of Paired Samples

	Average value	Number of cases	Standard deviation	Mean standard error
Blank control group	2.87	351	1.495	0.080
Experimental group	2.72	351	1.505	0.080

The correlation between the two groups of variables was 0.240, and the significance was 0.000<0.01, indicating a significant correlation, which was suitable for paired sample T test.

Table 3 Correlation of paired samples

	Number of cases	Correlation	Significance
Blank control group & Experimental group	351	0.240	0.000

The sig value of paired sample test is 0.134>0.05, and there is no significant difference between the two groups of questionnaires, which indicates that when the decision made by an algorithm reaches the level of the decision made in the questionnaire, we believe that the algorithm has leadership in the level of trust.

Table 4 Paired sample test

	Average value	Standard deviation	Mean standard error	Upper limit	Lower limit	t	Degree of freedom	Sig.
Blank control group - Experimental group	0.148	1.849	0.099	-0.046	0.342	1.501	350	0.134

5. Conclusion

This paper clarifies the concept of algorithmic leadership, analyzes its level according to the iceberg model, and designs a questionnaire for algorithmic leadership measurement based on the level of trust. In this paper, through two groups of control questionnaires, design questions, and data analysis by paired sample T test, it is found that there is no significant difference between the two groups of questionnaires, and it is considered that the algorithm trust questionnaire is effective.

References

[1] Zhou XX, Yu GL. The influence of gender and management class on employees' perception of leadership in Chinese context [J]. Journal of Harbin Institute of Technology (Social Sciences Edition),2022,(01):153-160.

[2] Li PH, Wang MW. How to Implement Interdisciplinary Organizational Reform in world-class Universities: An Analysis from the perspective of Leadership [J]. Higher Engineering Education Research,2022,(01):98-103.

[3] Sun J. Three-dimensional Model Design of Teacher Leadership: Construct Formation, Connotation Characteristics and Model Construction [J]. Journal of Education, 201,17(06):122-133.

[4] He LJ. Connotation, Implication and Promotion Path of Institutional Leadership [J]. Leadership Science,2021,(24):42-46.

[5] Zhang YL, Deng FX, Tang HT. CIO's own skills, demand-side leadership and digital innovation [J]. Management Review, 201,33(11):145-156.

[6] Henrique M. Digital Transformation and Digital Leadership.[J]. Healthcare informatics research, 2019, 25(4):350-351.

[7] Sawy OE, Kraemmergaard P, Amsinck H, etal. How LEGO Built the Foundations and Enterprise Capabilities for Digital Leadership[J]. Mis Quarterly Executive A Research Journal Dedicated to Improving Practice, 2016, 15(2):1-2.

[8] Redmond, GM. We don’t make widgets here”: Voices of chief nurse executives.[J]. Journal of Nursing Administration, 1995, 25(2):63-69.

[9] Harms PD; Han G. Algorithmic Leadership: The Future is Now[J]. Journal of Leadership Studies, 2018, 12(4): 74-75.

[10] Smith, AM.; Green M. Artificial intelligence and the role of leadership.[J]. Journal of Leadership Studies, 2018,12(3): 85-87.

Project name: 2022 National College students provincial-level innovation training program:Construction and measurement of algorithmic leadership, Project No.: S202210497115.