Cultural Communication Field Risk Challenges and Countermeasures Based on Artificial Intelligence Algorithms

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Abstract. In the "post-Internet era", there are many potential risks and challenges in the field of cultural communication. With the development of AI technology and the use of more and more extensive in the field of culture, the use is becoming more and more widespread and influential, and has become one of the future development areas. The current development of AI is rapidly changing, AI technology is constantly updated and breakthrough. Based on AI to achieve information transmission, processing, processing and other functions have been widely used in medical, education, transportation, finance, tourism, military and many other fields. In the field of cultural propaganda, it is important to make full use of AI to realize various functions, spread advanced cultural achievements and information, and popularize scientific knowledge more efficiently to shape national ideology and culture and improve national soft power. . This paper intends to analyze the possible risk problems of AI in the field of cultural propaganda and propose corresponding countermeasures. Based on the basic principles and ways of cultural communication, this paper discusses the current situation and development trend of AI application development in the field of cultural propaganda. It is proposed that the risk prevention and control of cultural propaganda based on AI algorithms should pay attention to the existence of "data islands", algorithm abuse and other problems and the application of related technologies to be improved; hot issues in the field of cultural propaganda based on AI algorithms can draw on the successful experience of AI in the field of cultural communication to deal with the corresponding And form a strategy.

Keywords: Artificial Intelligence; Cultural Advocacy; Risk Challenges; Strategy Analysis

1. Introduction

The application of AI in culture is promising, and cultural propaganda as one of its important components is mainly applied in many aspects such as cultural soft power enhancement and cultural communication capacity building. The role played by AI technology in the process of news information collection and dissemination will have a profound impact on the ideology of the audience; on the other hand, artificial intelligence algorithms (AIA) will help to improve the processing and application

process of cultural information optimization. However, it is also important to see the potential risk challenges of cultural propaganda based on AI algorithms to be solved and addressed [1-2].

In a related study, Doriana et al. used two technologies in order to promote and raise awareness of the Cathedral of St. Catherine of Alexandria in Galatina: spatial augmented reality, to embellish the monument and tell its story through images and sounds; and augmented reality, to facilitate the reading and interpretation of the most important frescoes located on all the interior walls of the cathedral [3]. Demonstrating how these technologies can be combined can be seen as an effective aid to support the enhancement, outcomes and understanding of monuments that are important to the cultural heritage sector and as a reference point for local and religious communities. Sathit ensures the preservation of historical artifacts by monitoring the contamination levels in the museum [4]. The proposed IoT system will be a cloud-based solution that will attempt to provide a wide range of functionality, including individual material analysis (paintings, metals, textiles, etc.). The prototype will include different components: monitoring stations, data collection and management servers, visualization, cloud database, security aspects using blockchain technology, and an alerting platform. With the support of the whole system, it will be possible to create immediate decisions for heritage conservation.

The application of AIAs in the field of cultural propaganda is accelerating, and through the collection and analysis of massive information resources, it can achieve accurate identification of hotspots in a shorter period of time, and can filter and process content with user preferences as the core. However, at the same time, because the AI algorithm itself possesses a certain degree of concealment and uncertainty, which makes it face certain risk challenges in the field of cultural propaganda. In order to avoid potential hazards, on the basis of clear guidelines for the development of the integration of culture and science and technology, we should strengthen the research on risk awareness, risk management system and risk warning technology of AIAs, and build a perfect legal and regulatory mechanism in the field of cultural propaganda.

2. Design Research

2.1 The Current State of Development and risk Challenges in the Field of Cultural Promotion based on AIAs

(1) Risk of information leakage by AIAs

AIA technology applied to the field of cultural propaganda requires users to use AI platforms to process and process news content and make it available to the public [5-6]. The lack of security mechanisms may lead to tampering or leakage of relevant information, or even generate security risks. Currently, obtaining information and accessing public information through online information collection has become one of the main tasks of many Internet companies. However, in the field of cultural propaganda, AI algorithms are at risk of sensitive privacy leaks. The risk of data leakage exists not only on cultural propaganda media platforms, but also on public Internet platforms [7-8]. For example, user comments and content analysis mechanisms used in social networks with huge amounts of information and presenting

diverse and personalized content may have a direct impact on users' personal privacy, which in turn affects their personal image, opinion orientation, and value orientation. In addition, users may over-interpret or even falsify information when posting content, making the risk of information leakage much higher [9-10].

(2) The negative impact of AI in the field of cultural promotion needs to be evaluated

As one of the future development directions, AI algorithms need to take into account certain socio-political and cultural factors while performing deep processing of cultural information. In reality, there are many problems in the process of AI in the collection and dissemination of cultural information that have yet to be solved by research [11-12]. First, the trust in the algorithm is not high. Cultural propaganda based on AI algorithms may lead to biases in the algorithms in terms of collecting content and judging emotional characteristics, which may create an illusion that the audience may identify with the information itself or with the viewpoint itself when browsing. In addition, AIAs applied to the field of cultural propaganda, in addition to the need for accurate screening of content, but also requires reasonable modeling and scientific analysis of data, however, many AI systems currently do not have the algorithmic models and reasoning capabilities required for intelligent algorithms [13-14].

(3) AIAs bring more "black technology" to penetrate the field of cultural propaganda

At present, with the development of AIAs, "black technology" is constantly being moved to the field of cultural propaganda. In the video creation launched by "Today's Headline", users only need to open the "Today's Headline" APP with a cell phone, they can edit the videos uploaded by users and generate relevant videos according to the relevant resources provided by the platform. These "black technology" technology is mainly used in the entertainment scene, short video creation field, its dissemination method is also more diversified and intelligent. As AIAs continue to penetrate into the field of cultural propaganda, relevant "black technology" will gradually penetrate into the cultural information production, distribution and other aspects. Algorithm technology-based cultural propaganda products have enriched the spiritual and cultural life of human beings, while also providing more convenience for people to produce and disseminate content. However, judging from the penetration of these "black technologies" in the cultural field, the application of "black technologies" often cannot completely eliminate people's needs and aversions to cultural information, and "black technologies the application of "black technology" is not absolutely safe and reliable, but also needs to be prevented. This also presents a challenge for the risks faced by the relevant information providers [15-16].

2.2 Problems Arising in the Field of Cultural Propaganda based on AIAs

In China, the application of AI technology in the field of cultural propaganda is not extensive enough and is still in the early stages of development, and its main problems include.

First, AI algorithms have autonomous learning functions, and their learning process will use algorithms to process existing information and present it to users. In this process, users need to constantly input various information, such as browsing news,

browsing short videos, browsing various comments, etc., which provides a breeding space for wrong information.

Second, there are relatively few existing data collection channels. After the application of AI technology in cultural and publicity, traditional data still need to be collected and analyzed, and important data need to be extracted and stored and preserved.

Third, the inability of new media platforms to effectively identify rumor information.

Fourth, the inability to deal with various problems such as rumors in a timely and effective manner after the emergence of intelligent terminals.

Fifth, current AI technology cannot yet achieve automatic recognition and real-time processing of textual content such as article titles and images.

Sixth, the current development of self-media platforms is still immature, making it difficult to effectively manage rumors generated by self-media platforms.

Seventh, the inadequate use of current AI technology to identify the impact of algorithms on the public.

Eighth, less application of AI technology and insufficient public participation cause the frequent occurrence of some undesirable events. There is a big problem based on the combination of AIA and propaganda field. On the one hand, AI technology itself does not give full play to its own advantages, leading to the generation of a large amount of misinformation; on the other hand, the algorithm itself has obvious defects to detect and remove such harmful information in a timely manner [17-18].

3. Experimental Research

3.1 Strategies for Coping with Problems in the Field of Cultural Propaganda based on AIAs

The cultural promotion department should continuously improve its own cultural literacy and professionalism, and at the same time strengthen its own sense of social responsibility and cultural responsibility, avoiding undesirable tendencies such as blind optimism and disregard for facts, and correctly guiding audiences, so as to effectively improve the credibility and influence of the cultural promotion department and promote the deeper integration of cultural promotion into social life and public thought. In the application of AI, attention should be paid to the strict supervision of AI algorithms. On the one hand, the mechanism and process of dealing with the problems, contents and impacts of AI algorithms should be established and strictly enforced. On the other hand, in terms of content production, strict and effective systems and processes should be developed to establish content auditing systems, monitoring and evaluation mechanisms, etc. to ensure that AI algorithms comply with national laws and regulations. In addition, in terms of information pushing to social network platforms, AI technology should be used to analyze data, in order to obtain more social resources, manipulate public emotions, spread false information and other issues. In addition, the use of AI algorithms to adversely affect the society should be avoided through various ways such as legislation to strengthen public moral awareness, enhance social responsibility awareness, and improve social integrity system.

3.2 Risk Challenges and Countermeasure Suggestions to Focus on in the Field of Cultural Promotion based on AIAs

At present, China is vigorously developing science and technology innovation and striving to build "four self-confidence". The field of cultural propaganda is one of the key areas of science and technology innovation and is highly anticipated. Traditional media has a lot of repetitive and invalid information, and so does the field of cultural propaganda, but AI plays an important role here, while traditional media lacks flexibility in communication, making it difficult to meet the public's demand for diversified culture and excellent spiritual values. And because of the differentiation of many factors such as the age and gender of the audience, it makes it more feasible to combine the field of cultural propaganda with user groups. On this basis based on AIAs cultural propaganda field will appear a large number of hot issues, such as false news, data monopoly, algorithm abuse, etc. is not conducive to the development of China's soft power. Therefore, we should focus on the common problems in cultural propaganda and deal with them accordingly and form a corresponding strategy. In this paper, we will analyze the hot issues in the field of cultural communication based on AI algorithms and propose corresponding strategies.

(1) Fake news: Improving regulation and algorithmic ethics

Fake news is an undesirable effect produced by AI algorithms. The application of AI can make the communication content more truthful and reliable, but AI systems cannot achieve complete exclusion and complete elimination of fake news. As news data continue to accumulate and algorithms play an important role in a certain event, fake news generated by algorithms in this field will become more prominent. This is mainly related to the characteristics of anonymity, sharing and infinity of online communication. Therefore, corresponding measures need to be taken to combat fake news, such as improving the strength of laws and regulations to punish fake news through mechanisms such as state punishment and accountability for fake news. In addition, it is also necessary to improve the construction of algorithm ethics and algorithm management system to ensure the fair and reasonable use of algorithms and prevent algorithms from being used as tools for profit-making.

(2) Data monopoly: Strengthening policy regulation and maintaining data security

Big data is the basis of future information, and the data monopoly behind it has become the main reason for the problems faced in the field of cultural propaganda based on AIAs. First of all, big data has a strong predictive ability for in-depth analysis of cultural content and user preferences, which can provide decision support for traditional media. However, the existence of algorithms can lead to data monopoly problems, such as algorithm abuse not only affects the user experience but also has a negative impact on the image of the country. Secondly, data monopoly can lead to a large number of unreasonable and improper behaviors of algorithm users in recommending contents or arbitrarily changing the recommended contents, which leads to a large number of contents being pushed to users but reduces their attention to the recommended contents and damages the interests of users, which is the main reason affecting the effect of using big data. Finally, data monopoly will also lead to information security problems, legal disputes and business risks frequently. And in this issue China has introduced policies to regulate and guide.

(3) Algorithm abuse: increase regulation and enhance information disclosure

Algorithm abuse refers to the manipulation of users' personal behavior by AI systems through manual screening of information based on the trend of personalization of users' behavior, thus achieving a quick catering to users' preferences. However, such algorithm abuse does not exclude the use of algorithms for profit and illegal acts. In recent years, the problem of algorithm abuse has become more and more prominent and has affected people's use of information. On the one hand, because algorithms themselves are subjective and dynamic, there are phenomena of using algorithms to make profits for themselves or to obtain improper benefits. For example, the misuse of personal information for profit, resulting in the leakage of personal information; the use of data advantage to control the direction of public opinion, etc.. On the other hand, based on algorithm abuse may also bring threats to personal information security, resulting in the leakage of personal privacy data. Therefore, in response to the problem of AI algorithm abuse, the awareness of algorithm users' privacy data protection should be strengthened and the behavior of using algorithms should be regulated. Secondly, we should increase the supervision of algorithm abuse, monitor algorithm abuse and improve the level of information disclosure to ensure that algorithm users enjoy their basic rights and bring their values into play.

3.3 Working Procedures for Determining the Weights of Evaluation Indicators

The working procedure of evaluation index weighting by hierarchical analysis in this paper is as follows.

(1) In this paper, we invite experts who have participated in cultural propaganda and related fields to conduct one-to-one comparisons of the importance of each element of the same level and the same attribution, and then quantify the comparison results through proportional scaling to establish a judgment matrix for importance calculation, which is a process of quantifying experts' qualitative judgment on the importance of each index.

(2) Considering that the calculation of linear algebra of higher-order matrix is more complicated, this paper uses the square root method to calculate the maximum characteristic roots and eigenvectors of the judgment matrix, and the calculation process is as follows.

1) Calculate the product of the elements of each row of the judgment matrix Mi

$$M_i = \prod_{j=1}^{n} a_{ij}, i = 1,2,...,n \tag{1}$$

(2) Calculate the nth root of $\overline{M}_i$

$$\overline{W}_i = \sqrt[n]{M_i}, i = 1,2,...,n \tag{2}$$

3) Normalize the feature vector $\overline{W}=(\overline{W}1,\overline{W}2,\cdots,\overline{W}n)T$

$$W_i = \frac{\overline{\overline{W}}_i}{\sum_{k=1}^{n} \overline{\overline{W}}_k}, i = 1,2,...,n \tag{3}$$

4) Calculate the maximum characteristic root λmax

$$\lambda_{\max} = \sum_{i=1}^{n} \frac{(AW)_i}{nW_i} \tag{4}$$

(3) To perform consistency test on the judgment matrix, first calculate the consistency index of the judgment matrix C.I.

$$C.I. = (\lambda_{\max} - n)/(n-1) \tag{5}$$

Introduce the random consistency index R.I. and calculate the consistency ratio C.R.

$$C.R. = C.I./R.I. \tag{5}$$

If C.R.=0, the decision matrix is a matrix with perfect consistency; if C.R.<0.1, the decision matrix is a matrix with satisfactory consistency; if C.R.>0.1, the decision matrix is inconsistent. If the scoring matrix has perfect or satisfactory consistency, the test passes and the eigenvector of the scoring matrix is the weight vector; if the scoring matrix has no consistency, the test fails and a new experiment must be conducted to recover the scoring matrix and calculate the importance of the scoring metrics.

4. Experimental analysis

4.1 Institutional Culture

(1) The calculation results and analysis of indicators are shown in Table 1 and Figure 1.

Table 1. institutional culture indicator results

Target level	Guideline layer	Indicator Level	Results
Governing culture	Status of Soil and Water Conservation	Percentage of assessment of soil and water conservation work	1.7%
		Percentage of expenditure on soil and water conservation projects	10.9%
		Degree of implementation of soil and water conservation projects	72 points
Managing culture	Status of Implementation of River Chief System	Degree of implementation of the River Chief System	85 points
		Assessment documents for the work of the river chief system	5 pieces
		Proportion of water consumption for irrigation of farmland	78.8%
	Status of Strictest	Proportion of water consumption of 10,000	60.1%

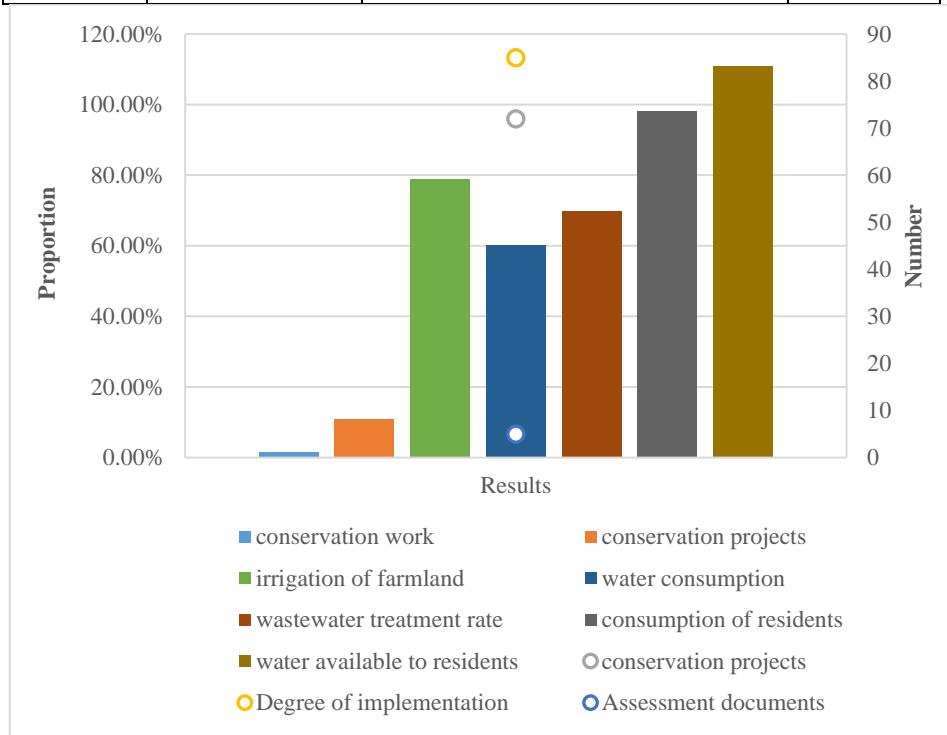|	Water Resources Management	Yuan GDP	
		Urban wastewater treatment rate	70%
Using culture	Public water use	Average water consumption of residents	98.2%
	Public water rights	Average amount of water available to residents	110.9%

Fig.1 Analysis of results for institutional culture indicators

(2) Description of calculation results

(1) the proportion of soil and water conservation work assessment

According to the assessment indexes of the annual target responsibility statement in the public information of the website, only 1 of the total 60 assessment indexes is related to soil and water conservation, so the assessment ratio of soil and water conservation work is 1.7%.

(2) Soil and water conservation project expenditures as a percentage

According to the annual financial expenditure statement, the expenditure of soil and water conservation projects was 7.12 million yuan, and the total expenditure was 65,457,200 yuan, so the proportion of expenditure of soil and water conservation projects was 10.9%.

(3) the river chief system work assessment documents

According to the statistics of the implementation and assessment documents of the river chief system, there are 5 documents for the assessment of the river chief system.

(4) The proportion of water used for irrigation on farmland

The average acreage of water consumption for irrigation in the city is 246m3 and

the average acreage of water consumption for irrigation in the province is 312m3, so the ratio is 78.8%.

(5) Water consumption ratio of 10,000 yuan GDP

The city uses 28.5 m3 of water for 10,000 Yuan GDP and the province uses 47.4 m3 of water for 10,000 Yuan GDP, so the ratio is 60.1%.

6) Municipal wastewater treatment rate

According to the comprehensive improvement plan, the urban wastewater treatment rate is 70%.

(7) Proportion of average residential water consumption

The average water consumption of city residents is 234 m3 and the average water consumption of provincial residents is 238.2 m3, so the ratio is 98.2%.

(8) The proportion of average water available to residents

Define the average water available to residents as the ratio of the total local water resources to the urban population. The average water available to residents of the city is 790m3 , and the average water available to residents of the province is 712m3 , so the ratio is 111.3%.

(3) Analysis of results

From the statistical results of the indicators of the system culture, it can be seen that the overall condition of soil and water conservation is better, with more project expenditure, but the proportion of the station work assessment is low and not further included in the assessment of the work of the water mile.

The management of water resources in the Wuding River Basin is good, the allocation of the river chief system is reasonable, and special assessment documents have been issued on the specific contents of the river chief system; at the same time, the use of water resources in the Wuding River Basin is reasonable, the water consumption rates of agriculture and industry are higher than the provincial average, and the sewage treatment rate is high.

The residents of the Wu Ding River basin are more efficient in their use of water resources, with an average tax rate lower than the provincial average and a higher amount of available water than the provincial average.

4.2 Spiritual Culture

(1) The calculation results and analysis of indicators are shown in Table 2 and Figure 2.

Table 2.   results for spiritual culture indicators

Target level	Code level	Indicator layer	Results
Cultural awareness	Status of Cultural Practices Retention	Number of cultural practices preserved	4 items
		Percentage of cultural awareness announcements	10.9%
	Status of government cultural promotion	Number of cultural talks organised by the government	1 time
		Cultural literacy rate	36.7%
Cultural education	Level of cultural popularisation and education	Popularity of culture in primary and secondary schools	32.1%
	Level of cultural research	Degree of cultural studies	23 points
		Extent of cultural majors conducted in higher education	32.1%

Cultural creation	Status of cultural production	Number of cultural works	≥200 pieces

(2) Description of calculation results

1) Number of preserved cultural practices

By conducting a survey of the city's cultural heritage and counting the cultural practices among them, the number of cultural practices was counted as 4.

(2) Percentage of cultural promotion announcements

According to the statistics of the water resources news and water dynamics section of the public information on the website of the Municipal Water Affairs Bureau, the cultural publicity announcement is 6 items, and the total announcement is 90 items, so the percentage is 10.9%.

3) Number of cultural lectures organized by the government

According to the statistics of the lecture category held by the Municipal Water Bureau, the number of cultural lectures organized by the government is 1.
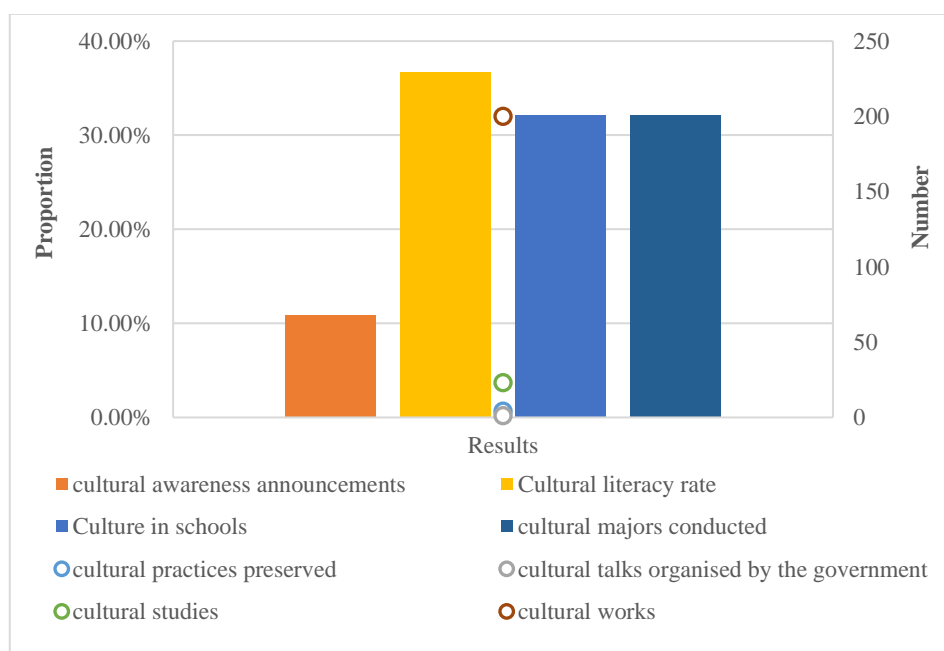

Fig.2 Analysis of results for spiritual culture indicators

4) Cultural knowledge general rate

The survey returned 169 valid questionnaires, and all the responses were counted, and a total of 372 "yes" responses were obtained, so the cultural literacy rate was considered to be 36.7%.

5) Culture prevalence rate in primary and secondary schools

A total of 812 valid questionnaires were collected from 10 schools, 2 grades from each school, and one class from each grade, and a total of 1,565 "yes" responses were obtained from all the responses, so the prevalence of culture in primary and secondary schools is considered to be 32.1%.

6) Degree of cultural research

A total of 10 experts in related fields were consulted, and the city's cultural research degree was evaluated based on the city's cultural research projects and related papers in recent years, with an average score of 23.

(7) The degree of development of cultural specialties in universities

The survey returned 56 valid questionnaires, and all the responses were counted, and a total of 126 "yes" responses were obtained, so the degree of cultural specialization in universities was considered to be 32.1%.

(3) Analysis of results

The results of the institutional culture indicators show that only a few cultural practices have been preserved in the Wuding River basin, and more culture-related traditions have been lost. From the perspective of government propaganda, the government lacks the propaganda of culture, and seldom publishes propaganda announcements and holds related lectures; through the survey of social workers, it is found that the knowledge of culture is concentrated among young people, and their occupations are limited to students and civil servants. However, through the introduction of cultural connotations, most people still have a strong willingness to promote (80%).

From the perspective of culture education, both primary and secondary schools and higher education institutions lack education and promotion of culture, as well as knowledge of culture, and most people have not been exposed to relevant courses and lectures (the scores of questions 1 and 2 are relatively low); in primary and secondary schools, after a certain amount of cultural knowledge is taught, some people are willing to spend their time after school to contact culture and promote it, but in higher education institutions, students still However, in higher education institutions, students still have difficulty recognizing culture as a professional course of study and are less willing to participate in similar work; at the same time, teachers and researchers in higher education institutions lack research on culture and are less likely to recognize its scientific aspect.

5. Conclusions

Due to the hidden and uncertain characteristics of AIAs, there are certain risk challenges in the application of cultural propaganda field, especially for the hidden and uncertain problems of AIAs themselves. The development and application of AI technology is also in continuous optimization and improvement. The combination of AI technology and traditional media is both an efficient means and a highly effective mode of communication. However, at present, AI algorithms do not have a fundamental impact and change on social culture, and we still need to pay attention to the problem of its hiddenness and uncertainty in the process of using AI algorithms. Therefore, we should start from the socio-cultural level for security governance research, combine the development and application of this technology with cultural security, and continuously explore and improve the security strategy and mechanism of its application in the field of cultural propaganda to ensure a stable cultural security situation.

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