

Research on the Impact of Algorithm-Mediated Social Media Search on Cognitive Construction

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Abstract. With the development of the social media, the character of “search-engine” gradually becomes more apparent. Nowadays many people tend to search for answers on social media when they meet problems. This paper explores the impact of the behavior of searching information on social media on cognitive constructions with the mediation role of algorithm. This study mainly collected data through questionnaire surveys, and then used it for correlation analysis and mediation analysis. The findings indicate that the behavior of searching information on social media play a positive role in cognitive construction and the algorithm serves as a partial intermediary factor in the relationship between them. In the era of big data, with the development of the information pushed by algorithms, people gradually turn from searching information in traditional search engines (one-way reception) to the social media platforms (two-way interaction), which change peoples’ cognitive constructions. This study will be helpful and instructive for the development of social media and the AI smart search launched in recent years.

Keywords: Social media, cognitive constructions, search, algorithms

1. Introduction

According to “the 55th Statistical Report on China's Internet Development”, the number of search engine users in China will reach 878 million, an increase of 51.12 million from December 2023 by 2024. It is also proposed that content-generating social network platforms such as Xiaohongshu (RED) have become an important new force in the industry [1]. The “2024 Xiaohongshu Trends and Brand Play Analysis” released by Jieshu Consulting agency showed that users of RED made it become “next-generation search engines” and “national Life Guide” by the way of “browsing-searching-sharing” [2]. This study paid more attention to the emerging search behavior on social media. It is also really meaningful for comparing the impact of traditional search engines based on PGC and social platforms based on UGC on people's cognition. Questionnaire survey method is applied for this research to collect the data of target group, whose advantage is that it can accurately identify significant correlations between variables by performing correlation analysis, mediation analysis and other analytical methods on the data. The final objective of this study is to explore how the habit and content of search can influence the cognition in the environment of social media and

whether algorithms play a mediation role in it. What is more it also can provide useful reference for other social media like Wechat and AI search function launched by search engines.

2. Literature review

Yan wanying published an article called “A study on the phenomenon of Xiaohongshu's 'search engine' from the perspective of media affordance theory”. In this paper, the author analyzed the feasibility of media search from the perspective of media affordances. It contributed to this research on social media search behavior, but it did not refer to the negative impact of information cocoons and the erosion of search neutrality by platform commercialization [3]. In the paper “Analysis of the characteristics, advantages and disadvantages of social media 'search engine' - taking Xiaohongshu as an example”, Wang Xiaomeng clarified four main features and the merits and drawbacks of content search on social media. It contributed to this paper on the basic situation of social media search. However, it only relied on public data from the platform, lacking of actual survey data and did not fully study the algorithm [4]. Cui Xinyuan and other researchers analyzed the impact of search engine free ranking mechanism, advertising ranking mechanism, user self-generation and spam indexing on the spread of fake news in the paper “Research on fake news governance of search engines”. It helped this study in understanding information push in search engines, but it mainly focused on the measures of how to solve the problems instead of changes in user perception of social media search behaviors [5]. Yang Bo published an article “Social media becomes search engine for European and American users”, which clarified the causes of social media searches, contributing to this study in exploring user search motivations. In contrast, it didn't reveal how search behaviors affect the cognitive contributions [6]. The research “Sharing of misinformation on social media: influencing factors, theoretical explanations, and interventions” published by Wang Zhichao and other scholars, indicated the reasons of why the wrong message can be spread and the factors which can affect it. It also proposed many intervention methods, which contributed to this study in understanding the mechanisms of information dissemination on social media. However, it mainly focused on the sharing of misinformation and did not examine the role of social media search behavior in it [7]. In “A study on the factors influencing social media users' intention to verify before sharing in the context of distorted health information”, Xue xiang explored many effect factors including perceived behavioral control, attitude, and subjective norm and found that perceived information overload has a negative regulatory effect on verification intention. It was conducive to this study on user information verification behavior but it was not comprehensive enough in the study of cognitive changes influenced by algorithmic recommendations [8]. Wang Xindi and other researchers published an article “The impact of intergenerational learning on the elderly's health science knowledge sharing behavior from the perspective of social media affordance”. This article concluded that aesthetic affordances, self-expression affordances, and collaborative affordances had a positive impact on intergenerational communication and knowledge transfer. It contributed to this research in information dissemination behavior, but its subjects were the elderly which lacks of university [9]. In “Analysis of the operation path of scientific and technological journals based on sharing social media—from the perspective of media affordance theory”, Shi Zilin and other scholars analyzed the advantages of social media in the aspects of productive affordances, social affordances, and mobility affordances. However, its focus was on how to operate a scientific journal instead of social media search and cognitive constructions [10].

This paper will start from the interaction between user search behavior and algorithm recommendation and take algorithms into account to analyze the interaction among the various factors comprehensively.

3. Methods

3.1. Questionnaire design

In this study, the independent variable is social media search behavior, the dependent variable is cognitive construction, and the mediating variable is algorithm. According to the literature review and interview, the independent variable is divided into two dimensions (search habit and search content). There are also four sections of the dependent variable, including selective contact preference, perception of information authenticity and richness, affective belonging and commitment and behavior modification tendency.

There are 20 questions in the questionnaire. Among them, 5 items measure basic information, 6 items measure independent variables, 4 items measure dependent variables, and 5 items measure mediating variables. According to the dimension of the independent variable, 6 items are divided into 4 and 2 items separately. Five-point scale, which is from 1 ("strongly disagree") to 5 ("strongly agree"), are used to measure and its Cronbach's alpha is 0.868. The questions about the mediating variable are also set up based on the effect characteristics of the algorithm.

3.2. Data collection

This study uses the method of questionnaire survey. After excluding invalid questionnaires where all respondents chose the same answer or answered in a regular pattern (such as 1, 2, 3, 4, 5 in a cycle) and questionnaires with obvious centripetal answer tendencies, a total of 212 respondents were collected. In the final sample, males account for 40.57% and female account for 59.43%. The proportion of undergraduate is 90.09%, and the percentage of postgraduate is only 9.91%. What is more about the frequency of social media use, the higher users who use it from multiple times a day to 3-5 times a week account for 77.36%, and the lower one just account for 22.64%. Besides this, the figure of people who use social media more than 30 minutes is 59.43%, with the number of those who use it less than 30 minutes accounting 40.57%.

3.3. Model introduction and result assumptions

The basic model of this study is shown in Figure 1:

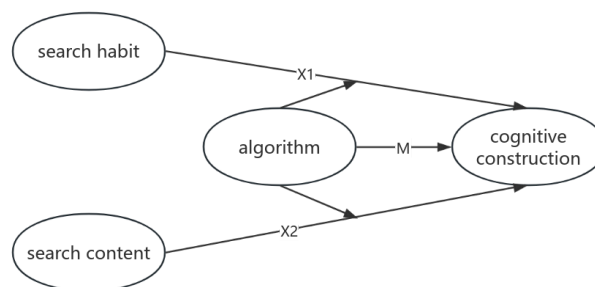


Figure 1: The basic model of this study.

According to the literature research and interviews, it is obvious that personal cognitive is closely related to the behavior of searching information, and it mainly contains two aspects -searching habit and search content. If users use social media to search information more frequently or the quality of the content is higher, their cognitive tends to be improved. By contrast, if the interaction frequency

or the quality of the message is lower, it may not be able to promote their cognitive to change or even affect the right cognition. Based on the above logical relationship, this study proposes the following hypothesis.

Hypothesis1: Search habit in social media searches and cognitive construction have a significant positive correlation.

Hypothesis2: Search content in social media searches and cognitive construction have a significant positive correlation.

Hypothesis3: The algorithm of RED plays a mediating role between search habit and cognitive construction.

Hypothesis4: The algorithm of RED plays a mediating role between search content and cognitive construction.

4. Result

4.1. Descriptive statistics

Table 1: The result of descriptive statistics(N=212).

Title	N	Minimum	Maximum	Mean	Standard deviation	Median
Search habit	212	5.000	16.000	10.311	2.247	10.000
Search content	212	3.000	14.000	5.179	2.453	4.000
Cognitive construction	212	23.000	60.000	44.788	9.381	44.500
Algorithm	212	6.000	24.000	17.316	5.114	20.000

From Table 1, it is obvious that four variables have their own characters. The search habit is relatively concentrated when the search content is distributed an on low-level. The difference of cognitive construction is significant and in the middle range, and the algorithm is unevenly distributed and presents a medium level.

4.2. Correlation analysis

Table 2: The result of correlation analysis(N=212).

	Mean	Standard deviation	Search habit	Search content	Cognitive construction	Algorithm
Search habit	10.311	2.247	1			
Search content	5.179	2.453	0.142*	1		
Cognitive construction	44.788	9.381	0.359**	0.309**	1	
Algorithm	17.316	5.114	0.389**	0.280**	0.665**	1

Note: The value below the diagonal line is the Pearson correlation coefficient. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The same below.

Table 2 reveals that search habit all show significant with search content, cognitive construction and algorithm. The correlation coefficients are 0.359,0.142,0.389 separately. All of them are bigger than zero, which means that there are positive correlation relationships among search habit, search content, cognitive construction and algorithm.

4.3. Regression analysis

Table 3: The result of linear regression analysis(N=212).

	Unstandardized coefficients		Standardized coefficients	t	p	Collinearity diagnostics	
	B	Std. Error	Beta			VIF	Tolerance
Constant	25.722	2.862	-	8.986	0.000**	-	-
Search habit	1.344	0.261	0.322	5.141	0.000**	1.021	0.980
Search content	1.005	0.240	0.263	4.197	0.000**	1.021	0.980
R ²			0.197				
Adjusted R ²			0.189				
F			F (2,209) = 25.603, p = 0.000				
D-W value			2.009				

Note: The dependent variable=cognitive construction.

Table 3 clarifies that linear regression analysis is conducted with search habit and content as the independent variable and cognitive construction as the dependent variable. The formula of model is: cognitive construction = 24.722 + 1.344*search habit + 1.005*search content, and the value of R² of the model is 0.197. It means that search habit and content can be explained the 19.7% of the reasons why the cognitive construction change. When performing an F test on the model, the research found that the model can pass the test (F = 25.603, p = 0.000 < 0.05), which suggests that at least one of the search habit or contents will have an impact on personal cognitive behavior. In addition, after multiple linear regression the result reveals that all of the values of the VIF in the model are smaller than five, meaning that there are no collinearity problems among them. Moreover the number of D-W value is around two, so there is no autocorrelation in the model and there is also no related relationship among the figure of sample. The model is superior and the final specific analysis shows that:

The value of regression coefficient of the research habit is 1.344(t = 5.141,p = 0.000 < 0.01),which means that the search habit exerts a significant positive influence on the cognitive construction. It demonstrates that the research hypothesis 1 is true.

The value of regression coefficient of the research content is 1.005(t = 4.197,p = 0.000 < 0.01),which means that the search content exerts a significant positive influence on the cognitive construction. It demonstrates that the research hypothesis 2 is true.

4.4. Mediator Effect Test

Table 4: The result of mediator effect test(N=212).

Item	Meaning	Effect	Standard error SE value	95% CI		Conclusion
				Lower bound	Upper bound	
Search habit=>Algorithm=>Cognitive construction	Indirect effect	0.209	0.037	0.138	0.283	Partial mediating effect
	Direct effect	0.113	0.055	0.006	0.221	
	Cumulative effect	0.322	0.063	0.199	0.445	
Search content=>Algorithm=>Cognitive construction	Indirect effect	0.134	0.028	0.079	0.189	Partial mediating effect
	Direct effect	0.129	0.053	0.025	0.232	
	Cumulative effect	0.263	0.063	0.140	0.386	

Table 4 reveals the relationship of search habitat, algorithm and cognitive construction. First of all, in the aspect of indirect effect, algorithm plays a partial mediating role in affecting the cognitive construction. The effect value is 0.209 and the standard error SE value is 0.037. The lower bound and the upper bound which are in the 95% CI are 0.138 and 0.283 separately. Secondly the value of direct effect is 0.113 and the standard error SE value is 0.055. In the 95% CI, the lower bound is 0.006 and the upper bound is 0.221. It suggests that the search habit can affect the cognitive construction directly as well. Finally, the value of cumulative effect is the 0.322 as well as the standard error SE value is 0.063. It reflects the cumulative effect of the search habits on individual cognitive construction, whose lower bound and upper bound are 0.199 and 0.445 separately in the 95% CI.

Table 4 also proves the relationship of search content, algorithm and cognitive construction. The figure of indirect effect presents that algorithm also exerts partial mediating effect on the cognitive construction. The number of the effect is 0.134 and the standard error SE value is 0.028 with the lower bound and upper bound are 0.079 and 0.189 separately in the 95% CI. This means that the search content can have a certain effect on the cognitive construction through the algorithm. By contrast, the number of the direct effect is 0.129 and the standard error SE value is 0.053. It states that the search content can affect the cognitive construction diametrically as well as the lower bound is 0.025 and the upper bound is 0.232. In addition the figure of cumulative is 0.263, while the standard error SE value is 0.063 and the lower bound and upper bound are 0.140 and 0.386 separately in the 95% CI. It reflects the comprehensive effect of the search content on the cognitive construction.

In summary whether the search habit or the content, the algorithm all can plays partial mediating roles in affecting the cognitive construction. At the same time, the search habit and the content also can affect cognitive content directly. For these reasons, the research hypothesis 3 and 4 are established.

5. Discussion

This paper proposes the following reasons that the social media searches might affect the cognitive construction. Firstly users always act as the searchers and the receivers of the message in the traditional search engines, lacking of the motivation and creation. However when searching for information on social media such as RED, the expression of the search results are more personalized which can reduce the sense of distance which is brought by the traditional search engines. Moreover the practicality and authenticity of the comments under the original articles are conducive to users to think actively and have emotional resonance [3,4]. Secondly traditional search engines usually classify and display search results according to their presentation form and use an advertising ranking mechanism [5]. By contrast the RED integrates various types of information on the same page and uses a personalized sorting mechanism. This way can lower the understanding threshold increasing the user search experience as well as the attractiveness and spread of the content [4]. In addition the traditional search engines tend to use the objective information such as policy documents, statistics and reports to enhance the accuracy and completeness of the information and set up the image of authority. Conversely the contents of RED are mostly UGC, which can transform users' personal experiences into searchable "micro-narratives" to form an "experience knowledge base". It is not only easier to establish the emotional trust with the users but also can make users willing to imitate it to achieve the transfer learning, even the cognitive restructuring and behavior change.

However, there are also many problems because of the RED's characters like UGC and "planting grass". First of all the message pushed by the algorithm might form the information silos through the filter bubbles, letting users click the fake message and increase the possibility of receiving such information [5]. Secondly fake information spread much faster than the truth and it is easier to disguise as information with utilitarian or entertainment value as well which the algorithm of the social media might give priority to express those contents which are more attractive but unverified[7]. Thirdly it is difficult to trace fake message and misinformation and there are many ads hiding in it which are hard to distinguish. Furthermore, multi-scenario adaptation and the sense of situation bring users immersive experiences, but also lead to the dilemma of "situational collapse". In light of these reasons, it is critical for platform to improve the review to control the authenticity of platform information and for users to strengthen the media literacy.

It is worthy to state that as this study adapt the method of questionnaire survey to collect data, although a certain scale of samples can be obtained, they are easily interfered by subjective factors of the survey subjects. Additionally the subjects might give inaccurate answer because of the memory Bias or give the answers that conform to the general understanding of society due to the sense of shame. It is better for the future research to combine the in-Depth Interviews to learn more about user's real thoughts and behaviors when they use the social media search and get more reliable and profound result. Moreover, there are also many limitations about the variables. Taking the social media search behavior as an example, this paper divides it just only search habit and search content. In fact, with the development of social media search, search habit can be divided more detailly such as search scene and social relationship dimension (Prioritize searching from the homepages of bloggers you follow).

6. Conclusion

The result of this research shows that every dimension of social media search behavior exerts positive influence on cognitive construction and the algorithm plays the partial mediating role in it.

To be more specific, if users often use social media search, they tend to be reconstructing cognition, and the algorithm intervention and induction will also affect users' search behaviors which indirectly affects the user's cognitive construction. This paper provides lots of valuable reference for future research in this direction. It clarifies that how the algorithm of the social media affect the cognitive construction and the development process from the traditional one-way search behavior to the two-way interactive retrieval behavior. It has significant impact not only on improving the quality of platform information and users' media literacy, but also on controlling algorithm scale and preventing the algorithm domestication. The further researches in the future should more focus on the contextual and scenario-based search and with the development of the technique of artificial intelligence, it is also worthy to invest the AI search function.

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