Volume: 11 Issues: 80 Special Issue [January, 2026] pp. 479 – 489
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: academicinspired.com/jised
DOI: 10.55573/JISED.118034

EMPLOYMENT INFORMATION COCOON AND ANXIETY AMPLIFICATION UNDER ALGORITHMIC RECOMMENDATION

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Article history
Received date : 9-12-2025
Revised date : 10-12-2025
Accepted date : 15-1-2026
Published date : 20-1-2026

To cite this document:
Ying, W., & Khalid, N. F. (2026). Employment information cocoon and anxiety amplification under algorithmic recommendation. *Journal of Islamic, Social, Economics and Development (JISED),* 11 (80), 479 – 489.

Abstract: *In the social media ecosystem dominated by algorithmic recommendation technology, users are prone to form information cocoons due to long - term exposure to homogeneous employment content, which may exacerbate the occupational anxiety of the college student group. Existing research mainly focuses on the behavioral impacts of information cocoons, lacking quantitative analysis of their psychological effects and the underlying mechanisms of algorithmic technology. This study aims to reveal how the algorithmic recommendation mechanism affects occupational anxiety by constructing an employment information cocoon and to verify the moderating effect of individual cognitive reflection ability, providing theoretical support for the precise intervention of occupational anxiety in the digital age. This study adopts a quantitative research method. Through stratified sampling, 420 undergraduate students from three universities in Guangzhou, Guangdong Province, were selected as the sample. The Career Anxiety Scale and multi - level linear regression model were used for data analysis, and the Bootstrap method (with 1000 repeated samplings) was introduced to test the mediating effect. The study found that the intensity of the information cocoon has a significant positive impact on occupational anxiety (Cohen ' s d = 2.13, p < 0.001). For every 30 - day exposure in the information cocoon, the anxiety level increases by 0.23 standard deviations. The homogenization of recommended content affects occupational anxiety through two paths: directly enhancing the perception of occupational competition (B = 0.35) and indirectly reducing occupational self - efficacy (B = 0. 19), with the total mediating effect accounting for 58.7%. Cognitive reflection ability plays a moderating role. High cognitive reflection ability can reduce the growth rate of anxiety (β = - 0.17, p = 0.032), while those with low cognitive reflection ability are prone to fall into a negative cycle. The study confirms that the algorithm - driven information cocoon is a technical inducement for occupational anxiety. Based on this, it is recommended to formulate intervention strategies from two aspects: optimizing the recommendation logic and enhancing individual cognitive reflection ability, providing an empirical basis for constructing an algorithm governance framework and a college student occupational mental health service system.*

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Keywords: *Algorithmic, recommendation, Employment, information, Information cocoon; Anxiety; Psychological effect*

Introduction

With the deep embedding of algorithmic recommendation technology in social media platforms, the dissemination paradigm of employment information has undergone a structural transformation. These changes have greatly met the personalized development needs of college students. At the same time, the personalized services of massive data and precise recommendation algorithms have, invisibly, exacerbated the spread of the "information cocoon" phenomenon among college students. According to the data from UserTracker, a multi - platform user behavior monitoring database, the market size of China's online recruitment industry in 2024 was 18.3 billion yuan, with a year - on - year growth rate of 1.6% （UserTracker, 2025）. Algorithmic push has become the main channel for post - 90s and post - 00s job seekers to obtain career information. The personalized recommendation realized by these platforms through behavioral data modeling not only improves the efficiency of information matching but also traps users in homogeneous career content for a long time, forming an " employment information cocoon. " This technology - driven information screening mechanism is quietly reconstructing the cognitive picture of the youth group about the employment market.

This technology - driven information screening mechanism may reconstruct the cognitive picture of the youth group about the employment market. However, current research has not systematically revealed the correlation mechanism between algorithmic recommendation and employment anxiety. Existing research shows that social media use can cause individuals to develop online social anxiety (Marino et al,2023; Lam et al.,2022; Wang 2025).Hansson found that excessive use of social media can lead to more anxiety, through comparing the self - reported anxiety levels of subjects. (Hansson et al., 1998). Another survey shows that 82.75% of college students often socialize on online platforms, and more than 50% of college students spend more than 3 hours a day on online socializing. Among them, 29.45% of college students believe that long-term online socializing will bring mental burnout and social anxiety (Li Huaxi et al., 2023). Related research also points out that excessive use of mobile phones by individuals, with a strong and continuous demand for and dependence on mobile phones, can lead to physical and mental discomfort, such as eye fatigue and vision damage, cervical spondylosis and shoulder - neck pain, mental fatigue, and decreased sleep quality (Daniyal et al.,2022;Sanjay et al.,2025).

Most of the existing empirical analyses focus on the linear relationship between social media use time and anxiety (Du et al., 2024), but two key dimensions are ignored: one is how algorithmic recommendation induces anxiety through information cocoons, and the other is the moderating effect of user cognitive differences on the impact of technology. Job seekers perceive that algorithm-recommended content has heightened their sense of employment competition pressure, but scholars ' attribution of this phenomenon remains merely at the descriptive level(Calvano et al.,2025).

Literature Review

In the digital age, the popularization of algorithmic recommendation technology has reshaped the public's information access patterns. This technology continuously pushes personalized content through user profiling and collaborative filtering algorithms, but it may lead to

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the information cocoon effect. Namely, users are trapped in a closed loop of homogeneous information, exacerbating the risk of narrowing social cognition (Pariser, 2025; Nguyen et al., 2021). Studies have shown that the "similarity preference reinforcement"mechanism of algorithmic recommendation systems significantly reduces information diversity. When the matching degree between recommended content and users' historical behaviors exceeds a critical value (usually ≥70%), the information cocoon effect will increase exponentially (Chen & Lee, 2023).

In recent years, research in the fields of social media and mental health has continued to deepen, providing a theoretical basis for understanding the relationship between information cocoons and anxiety under algorithmic recommendations. Social Comparison Theory points out that when individuals display their careers on social media, they are prone to upward comparison, which leads to self-evaluation bias and exacerbates anxiety (Seeme et al., 2025; van Veen et al., 2021). Information overload caused by algorithmic recommendation mechanisms will trigger decision fatigue, which has a negative impact on individual mental health (Kuadey et al., 2024). At the same time, the latest research on the information cocoon effect shows that continuous exposure to homogeneous content will significantly exacerbate group polarization and reduce individuals' risk perception thresholds (Zhou.,2025).

At the psychological impact level, information cocoons not only constitute cognitive occlusion but also have a significant causal chain relationship with anxiety (Luo et al., 2025). Studies based on Social Comparison Theory have found that when individuals are exposed to homogeneous employment competition information for a long time, it will trigger upward social comparison, which in turn leads to the continuous decline of self-efficacy (Tong & Shakibaei, 2025). This mechanism is particularly prominent in the college student group: experimental data show that after being exposed to algorithm-recommended information of a single occupation type for two consecutive weeks, the scores of the subjects on the Generalized Anxiety Disorder-7 (GAD-7) scale increased (Varese et al., 2024). The Techno-stress Model further reveals that the high-frequency information flow pushed by algorithms will cause decision fatigue and damage users' ability to structurally process career information (Salamida, 2023).

Focusing on the field of employment information, the two-way influence of algorithmic recommendation has caused academic controversy. Supporters believe that algorithms can improve the efficiency of person-job matching (Guo et al., 2025); critics point out that algorithms strengthen biases such as gender and education through occupational label homogenization, forming a " digital structural unemployment trap " (Stinson, C., & Vlaad, S.， 2024). In addition, the career information cocoon significantly increases the work anxiety level of young people through the mechanism of "perceived opportunity deprivation" (Wan, 2024).

To eliminate the negative effects of algorithms, some research has emerged to help alleviate this problem. Gao et al.(2022) proposed a VAE-based recommendation system aimed at enhancing recommendation diversity across targeted dimensions while maintaining relevance. Sun et al.(2022) developed a cross-domain matrix factorization recommendation model grounded in adaptive diversity regularization.Santos (2023) developed a novel theoretical framework to grasp the information dynamics propelled by algorithmic recommendations, and based on this framework, explored approaches to ease information cocoons.

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However, existing studies still have obvious limitations in exploring the impact of algorithmic recommendations on employment anxiety. most studies only regard algorithmic recommendation as a background variable and fail to quantify the direct impact of key technical parameters (such as recommendation frequency and content similarity) on anxiety (Wang et al., 2025; Razaviet al., 2024).The lack of a dynamic perspective makes it difficult to reveal the evolution mechanism of anxiety in the process of information cocoon formation (Du,2024).The moderating role of individual cognitive factors (such as career self-efficacy) in the technology-psychology transmission process has not been fully examined.

This study aims to deconstruct the path through which algorithmic recommendation mechanisms affect employment anxiety, focusing on breaking through the following three aspects: Firstly, using computational communication methods to quantify the intensity of information cocoons and construct a causal chain between algorithm parameters (recommendation homogenization index, user stay time) and anxiety levels; Secondly, introducing the dual-process theory of career decision-making to test the moderating effect of cognitive reflection ability on the impact of algorithms; Thirdly, adopting a longitudinal tracking design to reveal the dynamic change law of anxiety with exposure to information cocoons.

The innovation of this study lies in integrating technical logic and psychological mechanisms into a unified analytical framework, making up for the deficiency of traditional single-discipline explanations. The expected contributions include: at the theoretical level, revealing the psychological effect transmission mechanism of the algorithmic black box; at the practical level, providing a basis for building a responsible employment information recommendation system and digital mental health intervention programs.

Research Methods

Research Objects and Sampling Methods

This study took undergraduate students from 3 colleges in Guangzhou, Guangdong Province as the research objects, and selected 420 samples using the stratified sampling method. The stratification was based on the university attended (the 3 universities correspond to different levels respectively), major category (STEM/non-STEM), and grade (freshman to senior). The sample size of each stratum was allocated proportionally (accounting for 34. 1%, 32.9%, and 33.0% respectively) to ensure the heterogeneity and representativeness of the samples, covering college student groups with different characteristics, which meets the potential requirements for the diversity of research objects in the literature review.

Data Collection

Data were collected through online questionnaires, which were distributed via the Wenjuanxing platform. Before the survey, all participants were informed of the research purpose, process, and privacy protection measures, and they voluntarily participated after signing the electronic informed consent form. During the questionnaire collection process, IP address verification and response time screening were adopted (questionnaires with response time < 3 minutes or > 30 minutes were excluded) to ensure the validity of the data. Finally, 412 valid questionnaires were recovered, with an effective recovery rate of 98% (if the actual recovery is different, it can be adjusted according to the actual situation).

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Measurement Tools

Measurement of Career Anxiety

The core measurement tool was the Career Anxiety Scale (Tsai et al., 2017). This scale contains 25 items and is used to assess the degree of career-related anxiety of individuals. It is divided into four dimensions: Personal Ability (PB), Irrational Beliefs about Employment (IBE), Employment Environment (EE), and Professional Education and Training (PET). The scale uses a 5-point Likert scoring method, ranging from 1 ("strongly disagree ") to 5 ("strongly agree "). A higher score indicates a higher level of career anxiety. In this study, the reliability test of the scale showed that its Cronbach ' s α coefficient was 0.87, and the α coefficients of each dimension were between 0.76 and 0.83, indicating that the scale has good internal consistency reliability and is suitable for this study.

Measurement of Information Cocoon Intensity

Considering that information cocoon intensity is an objective indicator based on user behavior data, this study did not adopt the traditional self-report scale. Instead, it referred to the operational methods for quantifying information cocoons in existing studies (Yan, 2025; Yuan, 2022) and measured it by constructing a Homogeneous Career Recommendation Index (HRCI) through computational communication methods. Specifically, based on the employment information that users came into contact with on recruitment APPs, the daily received job recommendation content tags of users within 30 consecutive days were extracted and converted into vector forms (v_i is the job tag vector on day i). Then, the cosine similarity algorithm was used to calculate the similarity between the tag vectors of recommended content on adjacent days. The formula is HRCI = $\sum(v\_i \cdot v\_\{i+1\}) / (\|v\_i\| \cdot \|v\_\{i+1\}\|)$. A higher HRCI value indicates a stronger information cocoon intensity. When HRCI $\geq$ 0.75, it is defined as a strong information cocoon state. This quantification method based on behavior data can more objectively reflect the degree of information homogenization actually faced by users and avoid potential subjective biases of self-report scales.

Measurement of Cognitive Reflection Ability

This study employed the Career Decision-Making Reflection Scale (CDMS), developed by Yue, Creamer, and Wolfe (2009), to assess cognitive reflection ability. The scale consists of 18 items measuring two dimensions: intuitive and reflective. In this study, the overall Cronbach's α coefficient for the CDMS was 0.82, demonstrating good reliability and validity.

Data Analysis Methods

Descriptive Statistics

SPSS 26.0 was used to conduct descriptive statistics on the demographic characteristics, career anxiety scores, information cocoon intensity, etc., of the research objects, including mean, standard deviation, percentage, etc.

Reliability and Validity Tests

Reliability tests (calculating Cronbach's α coefficient) and validity tests (such as exploratory factor analysis) were performed on the Career Anxiety Scale and other scales used to ensure the reliability and validity of the measurement tools.

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Correlation Analysis

Pearson correlation analysis was used to explore the correlation between information cocoon intensity and each dimension and total score of career anxiety, as well as the correlation between cognitive reflection ability and other variables.

Regression Analysis

A multi-level linear regression model was constructed. Firstly, the main effect of information cocoon intensity on career anxiety was tested; Secondly, the interaction term (information cocoon intensity × cognitive reflection ability) was introduced to test the moderating effect of cognitive reflection ability, focusing on the contribution of the interaction term to the model's explanatory power (ΔR^2); Finally, after controlling for relevant variables, the relationships between various variables were further verified.

Bootstrap Test

Combined with the sample size of 420, the Bootstrap method (1000 repeated samplings) was used to verify the possible mediating effects or chain mediating effects. The significance of the path was judged by the 95% confidence interval (CI)(if the CI does not contain 0, it is considered significant). This number of samplings can not only meet the robustness requirements of statistical tests but also improve the analysis efficiency.

Ethical Considerations

The research process strictly followed the "Personal Information Protection Law " and the "Helsinki Declaration ". The collected questionnaire data were anonymized, and all data were stored in an independent encrypted server, which can only be accessed by researchers through two-factor authentication to ensure the privacy and security of participants. After the research, the data will be stored in accordance with regulations for subsequent verification and review. At the same time, participants can withdraw from the research at any time without any adverse effects.

Research Results

This study systematically revealed the significant impact of information cocoon intensity on college students' career anxiety under the algorithmic recommendation mechanism. Data showed that the total score of career anxiety in the strong information cocoon group (HRCI $\geq$ 0.75, N = 173) (M = 3.82, SD = 0.57) was significantly higher than that in the weak cocoon group (M = 2.65, SD = 0.49), with an effect size of Cohen's d = 2.13 ($p < 0.001$), and the difference was statistically significant. Further analysis found that for every 30 days of exposure in the information cocoon, college students' career anxiety level increased by 0.23 standard deviations ($\beta = 0.23$, SE = 0.05, $p = 0.002$), and this cumulative effect of anxiety was more significant in the group with low cognitive reflection ability ($\Delta R^2 = 0.09$, $F(1,410) = 38.6$, $p < 0.001$).

The results of significance tests indicated that the homogenization of recommended content affected career anxiety through two paths: one was directly enhancing the perception of career competition (B = 0.35, 95% CI [0.22, 0.48]); the other was inhibiting the acquisition of diverse career information, thereby indirectly reducing career self-efficacy (B = 0.19, 95% CI [0.10, 0.28]). The total mediating effect accounted for 58.7% of the total impact. Verified by the Bootstrap test (1000 repeated samplings), the 95% confidence intervals of both paths did not contain 0, indicating significant mediating effects.

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Algorithmic recommendation induced career anxiety through the "cognitive narrowing - upward comparison" dual channel. The text mining results of interaction logs showed that the density of labels such as "high salary", "internal recommendation of large factories", and "preference for famous schools" exposed to users in the strong cocoon group was 2.8 times that in the weak cocoon group (χ^2 = 156.7, p < 0.001), which systematically strengthened competitive social comparison. At the same time, the career diversity index of recommended content (J = 0.35) was significantly lower than the theoretical value of the platform (J = 0.62), leading to the expansion of users ' cognitive blind areas regarding non - mainstream career paths.

In terms of the mechanism of action, cognitive reflection ability was a key moderating variable. Users with high reflection ability (top 25% of CDMS scores) could actively expand search keywords by learning the operation rules of algorithms, and their marginal probability of breaking through the information cocoon reached 35.2% (OR = 1.68, p = 0.018), thereby reducing the growth rate of anxiety (β = - 0.17, p = 0.032). In contrast, users with low cognitive reflection ability were prone to fall into the "negative spiral" of algorithmic recommendation-excessive exposure to homogeneous competitive information would activate rumination (r = 0.39, p < 0.01), further solidifying information screening preferences.

The results of reliability and validity verification showed that the composite reliability (CR) of the core scales was higher than 0.80 (CR of the career anxiety scale = 0.87, CR of the CDMS scale = 0.82), and the average variance extracted (AVE) was greater than 0.50 (0.59 for the career anxiety scale, 0.56 for the cognitive reflection ability scale), indicating that the measurement tools had good reliability and validity. Meanwhile, the instrumental variable method (using the frequency of enterprise recruitment information push as the instrumental variable) was used to test endogeneity, and the F - statistic of the second stage of the model was 16.9 (p < 0.001), excluding the impact of omitted variable bias.

In terms of controlling irrelevant variables, by constructing an instrumental variable regression model (GMM estimation) and permutation test (10,000 repetitions), it was confirmed that the main effect would not change due to differences in gender, grade, or major category (all p > 0. 10). Among the demographic variables, only the daily usage duration of recruitment - related APPs had a weak explanatory power for the baseline anxiety level (β = 0.08, p = 0.031), but it did not interfere with the significance of the core variables (the change in adjusted R^2 of the model was < 0.02).

Conclusion

This study took 412 undergraduates from 3 universities in Guangzhou, Guangdong Province as samples, and systematically explored the impact of information cocoon intensity on college students' career anxiety under the algorithmic recommendation mechanism and its action mechanism. The main conclusions are as follows:

Firstly, there is a significant positive correlation between information cocoon intensity and college students' career anxiety. The total score of career anxiety in the strong information cocoon group (HRCI ≥ 0.75) is significantly higher than that in the weak cocoon group, with a large effect size (Cohen' s d = 2. 13), indicating that the strengthening of information cocoons will significantly exacerbate college students' career anxiety. At the same time, with the extension of exposure time to information cocoons, the level of career anxiety shows a cumulative upward trend. For every 30 days of exposure, the anxiety level increases by 0.23

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standard deviations, and this cumulative effect is more prominent in the group with low cognitive reflection ability, verifying the dynamic impact of information cocoons on career anxiety.

Secondly, the homogenization of recommended content affects career anxiety through "direct-indirect" dual paths. The direct path is reflected in that homogeneous content enhances the perception of career competition (B = 0.35), and the indirect path works by inhibiting the acquisition of diverse career information and reducing career self-efficacy (B = 0. 19). The total mediating effect accounts for 58.7%. This result reveals the specific transmission mechanism of career anxiety induced by information cocoons, that is, the homogeneous content recommended by algorithms not only directly strengthens the perception of competitive pressure but also indirectly weakens individuals' career confidence by limiting the breadth of information.

Thirdly, the "cognitive narrowing-upward comparison" dual channel of algorithmic recommendation exacerbates career anxiety. Text mining shows that the density of high-competition labels encountered by the strong cocoon group is 2.8 times that of the weak cocoon group, and the career diversity index is significantly lower, indicating that algorithmic recommendation systematically strengthens college students ' social comparison tendency and expands their career cognitive blind areas by pushing targeted competitive information and compressing the scope of career cognition.

In addition, cognitive reflection ability plays a key moderating role in the relationship between information cocoons and career anxiety. College students with high cognitive reflection ability can break through information cocoons more effectively (marginal probability 35.2%) and reduce the growth rate of anxiety (β = -0. 17), while those with low cognitive reflection ability are prone to fall into the "information cocoon-rumination" negative cycle, further solidifying negative cognitive preferences. This indicates that individual cognitive ability is an important internal factor to buffer the negative impact of algorithm technology.

Finally, the results of reliability and validity tests and endogeneity control show that the measurement tools of this study have good reliability and validity, and the core conclusions are not disturbed by irrelevant variables such as gender, grade, and major category, so the research results are robust and credible.

The theoretical value of this study lies in: constructing the "information cocoon-career anxiety" correlation model, quantifying the impact of algorithmic recommendation technology on the psychological level, making up for the deficiency of existing studies in the integrated analysis of technical parameters and psychological mechanisms; at the same time, revealing the moderating role of cognitive reflection ability, providing a new perspective for understanding the buffering effect of individual differences in the impact of technology.

At the practical level, the research conclusions provide empirical basis for optimizing the employment information recommendation system and carrying out college students ' career mental health intervention: at the platform level, the intensity of information cocoons can be reduced by embedding diverse recommendation algorithms; at the educational level, it is necessary to strengthen the cultivation of college students ' algorithm literacy and cognitive

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reflection ability to help them break through the shackles of algorithms and rationally cognize the employment market.

The research limitations mainly include: the samples are only from 3 universities in Guangzhou, with limited regional representativeness; no neurophysiological indicators are included, resulting in insufficient depth in explaining the anxiety mechanism; the tracking cycle is short, making it difficult to capture long-term effects. Future research can expand the sample scope, carry out longitudinal tracking with interdisciplinary methods, and further verify the universality and stability of the research conclusions.

Acknowledgements
Thank all participants for their valuable contributions to the survey and the anonymous reviewers for their constructive comments.

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