

Exploring College Students' Social Media Dependence through Perceived Usefulness and Time Perception Bias: An SEM-Based Study

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Abstract: Social media dependence among college students has become an important issue because intensive platform use may affect learning routines, psychological well-being, and self-regulated time management. This study examines how information needs, social needs, entertainment needs, environmental influence, and self-efficacy affect college students' social media dependence, with perceived usefulness and time perception bias specified as mediating mechanisms. Survey data were collected through online and offline questionnaires. A total of 309 responses were obtained, and 287 valid questionnaires were retained after excluding invalid responses, yielding an effective response rate of 92.9%. Reliability and validity were assessed using Cronbach's alpha, KMO, Bartlett's test, confirmatory factor analysis, average variance extracted, and composite reliability. Structural equation modeling in AMOS 29 and bootstrap mediation analysis were then used to test the proposed model. The results indicate that information, social, and entertainment needs significantly enhance perceived usefulness, whereas information needs, entertainment needs, and environmental influence increase time perception bias. Self-efficacy negatively predicts time perception bias. Both perceived usefulness and time perception bias significantly mediate the relationship between antecedent factors and social media dependence. This study extends the S-O-R and M-O-A models to the context of college students' social media dependence and offers implications for platform governance and media literacy education.

Keywords: Social media dependence; perceived usefulness; time perception bias; college students; structural equation modeling

1. Introduction

Social media platforms have become embedded in college students' everyday communication, learning, entertainment, and information-seeking practices. Their convenience can support social capital and peer connection, yet intensive and poorly regulated use may also produce problematic use patterns, sleep disruption, anxiety, low self-esteem, and weaker academic routines [1-3]. Studies of social networking addiction and problematic social media use show that dependence is not merely a matter of time spent online; it is also shaped by motivational reinforcement, perceived value, emotional regulation, and loss of control [4-6].

Existing international research has examined problematic social media use, social media addiction, depression, anxiety, academic performance, fear of missing out, flow experience, and perceived usefulness. Prior work has shown that FoMO may intensify checking behavior [7], that enjoyment and flow can increase platform attachment [8, 9], and that Facebook-related addiction is linked to multiple uses and gratifications [10]. Technology acceptance research also demonstrates that perceived usefulness is a core predictor of system adoption and continued use [11, 12]. However, comparatively less attention has been paid to the dual mediating path from perceived usefulness to time perception bias and then to social media dependence, especially among college students.

To address this gap, this study integrates the stimulus-organism-response (S-O-R) model with the motivation-opportunity-ability (M-O-A) model. In online behavior research, the S-O-R perspective explains how external stimuli influence internal cognitive and affective states and then produce behavioral responses [13]. The M-O-A framework further clarifies why users process media stimuli

differently by emphasizing motivation, opportunity, and ability [14]. Accordingly, this study treats information needs, social needs, entertainment needs, environmental influence, and self-efficacy as stimulus factors; perceived usefulness and time perception bias as organism-level responses; and social media dependence as the behavioral outcome. Time perception bias is especially relevant because immersive media use can distort users' awareness of elapsed time and weaken behavioral regulation [15].

This study makes four contributions. First, it integrates S-O-R and M-O-A models to explain the formation mechanism of college students' social media dependence. Second, it introduces perceived usefulness and time perception bias as mediating mechanisms linking user needs and contextual factors with dependence. Third, it provides empirical evidence based on 287 valid questionnaires from college students and tests the proposed mechanism using SEM and bootstrap analysis. Fourth, it offers practical implications for platform governance, time-feedback design, university media literacy education, and self-regulation training.

Compared with studies that focus mainly on symptoms of problematic use, this paper emphasizes the process through which dependence is gradually formed. College students may initially use social media for legitimate purposes, such as acquiring information, maintaining relationships, or relaxing after academic work. However, when these purposes are repeatedly satisfied through algorithmically organized content and continuous interaction cues, platform use may shift from intentional use to habitual and automatic use. This transition makes it necessary to examine not only whether students perceive social media as useful, but also whether they lose accurate awareness of the time spent on platforms.

2. Theoretical Background and Hypotheses

The proposed framework assumes that students' social media dependence develops through both value-based cognition and time-related misperception. Information needs reflect the desire to obtain news, social updates, and learning resources. Social needs capture maintaining relationships, following friends' updates, sharing content, and meeting like-minded peers. Entertainment needs refer to relaxation, enjoyment, and filling fragmented time. These three motivations are expected to increase perceived usefulness because students evaluate social media as more valuable when it efficiently satisfies their goals.

Perceived usefulness is introduced as a cognitive mediator because college students often justify frequent social media use by emphasizing practical benefits. For example, platforms can provide timely news, learning materials, campus information, peer communication, and emotional support. When students repeatedly experience these benefits, social media may become a default tool for solving daily problems. In this situation, perceived usefulness can strengthen continued use and reduce users' willingness to disengage from platforms.

Environmental influence represents peer usage, fear of missing information, information access pressure, and communication norms. Such influence can make platform checking more automatic and less consciously planned. Self-efficacy refers to students' confidence in achieving goals, completing tasks, and controlling their media-use duration. Higher self-efficacy is expected to reduce time perception bias because students with stronger self-regulation are more capable of monitoring elapsed time and interrupting overuse.

Time perception bias is treated as a behavioral-cognitive mediator that reflects the immersive quality of social media use. Unlike perceived usefulness, which is based on conscious evaluation, time perception bias indicates a weaker awareness of elapsed time during use. Students may intend to use a platform briefly, but continuous scrolling, short videos, social feedback, and personalized recommendations can make the actual duration longer than expected. This mechanism is particularly important for dependence because it captures the unconscious extension of use rather than only the intention to use.

Based on these arguments, the following hypotheses are proposed and organized into the theoretical framework shown in Figure 1: H1, information needs positively affect perceived usefulness; H2, social needs positively affect perceived usefulness; H3, entertainment needs positively affect perceived usefulness; H4, information needs positively affect time perception bias; H5, entertainment needs positively affect time perception bias; H6, environmental influence positively affects time perception bias; H7, self-efficacy negatively affects time perception bias; H8, perceived usefulness positively

affects social media dependence; and H9, time perception bias positively affects social media dependence.

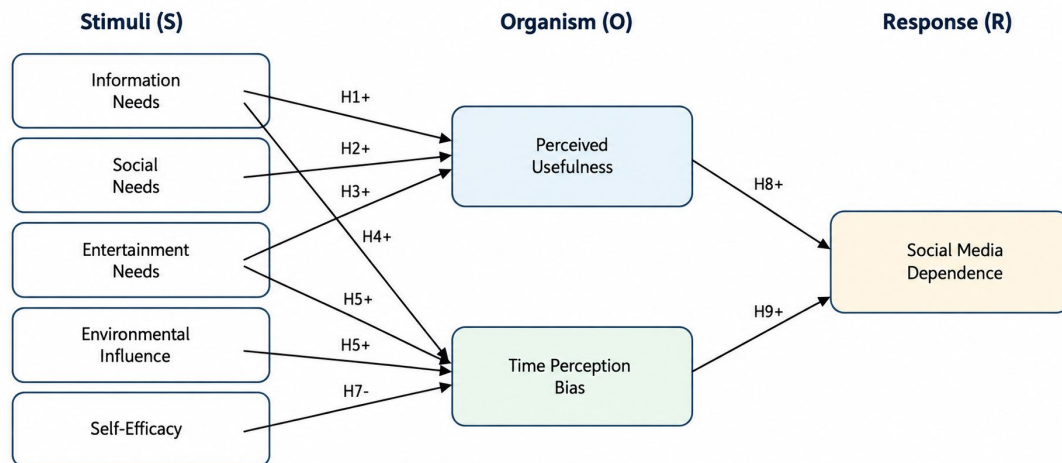


Figure 1. Theoretical Model

3. Methodology

3.1 Participants and Data Collection

A questionnaire survey was used to collect data from college students. The questionnaire contained two parts: demographic information and measurement items for the latent constructs. A total of 309 questionnaires were collected through online and offline surveys. After excluding invalid responses, including careless answers, inconsistent responses, and questionnaires completed in less than three minutes, 287 valid questionnaires were retained, with an effective response rate of 92.9%.

The combination of online and offline collection was used to improve sample accessibility and reduce the bias that may occur when all respondents are recruited through a single channel. Online questionnaires were mainly distributed through student networks, whereas offline questionnaires were collected from students in campus settings. Before formal analysis, responses were screened to ensure that the retained questionnaires reflected meaningful participation. This procedure helped improve the quality of the dataset used for SEM estimation.

3.2 Measurement

All constructs were measured using Likert-scale items. The constructs included information needs, social needs, entertainment needs, environmental influence, self-efficacy, perceived usefulness, time perception bias, and social media dependence. Information needs contained three items, social needs four items, entertainment needs three items, environmental influence four items, self-efficacy four items, perceived usefulness four items, time perception bias three items, and social media dependence four items.

The measurement items were designed to match the theoretical meaning of each construct. Information needs focused on obtaining news, social updates, and knowledge or skills. Social needs reflected relationship maintenance, awareness of friends' updates, content sharing, and meeting people with similar interests. Entertainment needs captured relaxation, enjoyment, and the use of fragmented time. Environmental influence included peer influence, fear of missing information, information acquisition, and communication pressure. Self-efficacy measured students' perceived ability to achieve goals, complete tasks, and control social media use.

3.3 Data Analysis

Reliability was tested using Cronbach's alpha. Validity was examined through KMO, Bartlett's test, confirmatory factor analysis, average variance extracted, and composite reliability. The structural relationships were tested using SEM in AMOS 29. Bootstrap analysis was used to examine mediation

effects and to determine whether the confidence intervals of indirect effects excluded zero.

SEM was selected because the proposed model contains multiple latent variables and simultaneous direct and indirect paths. This method allows the measurement quality of each construct and the structural relationships among constructs to be evaluated within a unified framework. In addition, bootstrap mediation analysis is suitable for testing indirect effects because it does not rely on the assumption that indirect effects are normally distributed.

The empirical model was specified through a measurement model, a structural model, and mediation equations. For each latent construct, the observed indicators were represented as follows:

$$x_i = \lambda_i \eta + \varepsilon_i, \quad i = 1, 2, \dots, k \quad (1)$$

where x_i denotes an observed item, η denotes the corresponding latent variable, λ_i is the factor loading, and ε_i is the measurement error. The structural relationships among latent variables were estimated as:

$$\eta = B\eta + \Gamma\xi + \zeta \quad (2)$$

where ξ represents the exogenous stimulus variables, η represents endogenous organism and response variables, B denotes relationships among endogenous variables, Γ denotes effects from exogenous to endogenous variables, and ζ is the residual term. The indirect effect of an antecedent variable on social media dependence through a mediator was calculated as:

$$\text{Indirect Effect} = a \times b \quad (3)$$

where a is the coefficient from the antecedent variable to the mediator and b is the coefficient from the mediator to social media dependence.

4. Results

As shown in Table 1, the sample was balanced by gender, with 45.3% male and 54.7% female respondents. Students from science and engineering accounted for the largest share of the sample, and the grade distribution covered undergraduate and postgraduate students.

Table 1. Demographic Characteristics of Respondents

Variable	Category	Frequency	Percentage
Gender	Male	130	45.3%
Gender	Female	157	54.7%
Major	Science and Engineering	101	35.2%
Major	Agriculture and Medicine	43	15.0%
Major	Humanities and History	76	26.5%
Major	Economics and Management	37	12.9%
Major	Arts and Sports	27	9.4%
Major	Other	3	1.0%
Grade	Freshman	42	14.6%
Grade	Sophomore	73	25.4%
Grade	Junior	70	24.4%
Grade	Senior/Fifth-year	65	22.6%
Grade	Postgraduate or above	37	12.9%
Only child	Yes	221	77.0%
Only child	No	66	23.0%
Residence	Urban	183	63.8%
Residence	Rural	104	36.2%
Monthly allowance	0-1000 yuan	20	7.0%
Monthly allowance	1001-2000 yuan	163	56.8%
Monthly allowance	2001-3000 yuan	82	28.6%
Monthly allowance	Above 3000 yuan	22	7.7%

The demographic distribution indicates that the sample included students with different academic backgrounds, school stages, family structures, residence types, and monthly allowance levels. This diversity provides a reasonable empirical basis for examining social media dependence among college students, although the sample should still be interpreted as a student sample rather than a representation of all social media users.

As shown in Table 2, all Cronbach's alpha values exceeded 0.80, indicating acceptable internal consistency. The KMO value and Bartlett's test supported factor analysis. The AVE values exceeded 0.50 and the CR values exceeded 0.70, suggesting satisfactory convergent validity and composite reliability. The fit indices also indicated a well-fitting measurement model.

Table 2. Reliability and Validity Results

Construct	Items / Model Information	Cronbach's alpha	AVE	CR
Information Needs	3	0.827	0.6223	0.8314
Social Needs	4	0.827	0.6035	0.8586
Entertainment Needs	3	0.824	0.6172	0.8281
Environmental Influence	4	0.815	0.6475	0.8798
Self-Efficacy	4	0.836	0.6042	0.8588
Perceived Usefulness	4	0.825	0.6249	0.8693
Time Perception Bias	3	0.827	0.6219	0.8307
Social Media Dependence	4	0.825	0.6025	0.8579
Overall validity and model fit	KMO = 0.862; Bartlett's chi-square = 3857.294, df = 406, p < .001; CMIN/DF = 1.283; RMSEA = 0.031; IFI = 0.984; TLI = 0.980; CFI = 0.984			

These results suggest that the questionnaire items were able to measure their intended constructs with sufficient stability. The factor loadings were generally above the recommended threshold, which means that the observed items explained a meaningful proportion of the variance in their corresponding latent variables. Therefore, the measurement model was considered suitable for subsequent structural path analysis.

As shown in Table 3, the SEM results supported all proposed paths. Information, social, and entertainment needs positively predicted perceived usefulness. Information needs, entertainment needs, and environmental influence positively predicted time perception bias, whereas self-efficacy had a significant negative effect. Both perceived usefulness and time perception bias significantly predicted social media dependence.

Table 3. SEM Path Coefficients

Path	Estimate	S.E.	C.R.	p	Result
Perceived Usefulness <- Information Needs	0.157	0.068	2.360	0.018	Supported
Perceived Usefulness <- Social Needs	0.303	0.074	4.264	< .001	Supported
Perceived Usefulness <- Entertainment Needs	0.243	0.049	3.627	< .001	Supported
Time Perception Bias <- Information Needs	0.238	0.080	3.511	< .001	Supported
Time Perception Bias <- Entertainment Needs	0.182	0.057	2.723	0.006	Supported
Time Perception Bias <- Environmental Influence	0.142	0.055	2.197	0.028	Supported
Time Perception Bias <- Self-Efficacy	-0.303	0.074	-4.431	< .001	Supported
Social Media Dependence <- Time Perception Bias	0.209	0.066	2.934	0.003	Supported
Social Media Dependence <- Perceived Usefulness	0.088	0.079	1.188	0.035	Supported

Among the antecedents of perceived usefulness, social needs showed the largest coefficient, suggesting that the relational function of social media is especially important for college students. For time perception bias, the negative coefficient of self-efficacy was also notable, indicating that students with stronger perceived self-control were less likely to experience distorted time awareness. The positive paths from perceived usefulness and time perception bias to social media dependence show that both conscious evaluation and unconscious immersion contribute to dependent use.

Figure 2 presents the standardized SEM results and the main model-fit indices. The graphical results further show that perceived usefulness and time perception bias jointly connect the antecedent factors with social media dependence, while self-efficacy serves as a negative predictor of time perception bias.

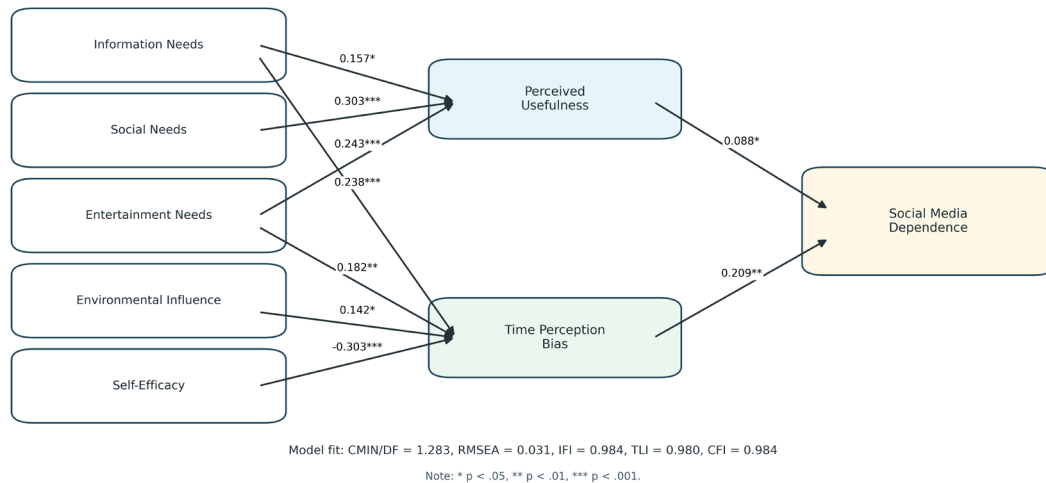


Figure 2. SEM Results

As shown in Table 4, the bootstrap results supported the mediating effects because the 95% confidence intervals did not include zero. Perceived usefulness mediated the effects of information, social, and entertainment needs on social media dependence. Time perception bias mediated the effects of information needs, entertainment needs, environmental influence, and self-efficacy on social media dependence.

Table 4. Bootstrap Mediation Effects

Indirect Path	Effect	Lower 95% CI	Upper 95% CI	p
Information Needs -> Perceived Usefulness -> Social Media Dependence	0.042	0.003	0.117	0.032
Social Needs -> Perceived Usefulness -> Social Media Dependence	0.081	0.028	0.165	0.001
Entertainment Needs -> Perceived Usefulness -> Social Media Dependence	0.045	0.014	0.091	0.001
Information Needs -> Time Perception Bias -> Social Media Dependence	0.101	0.035	0.185	0.004
Entertainment Needs -> Time Perception Bias -> Social Media Dependence	0.054	0.012	0.119	0.009
Environmental Influence -> Time Perception Bias -> Social Media Dependence	0.043	0.005	0.095	0.032
Self-Efficacy -> Time Perception Bias -> Social Media Dependence	-0.110	-0.192	-0.055	0.001

The indirect effects further clarify that different antecedent factors operate through different mechanisms. Motivational factors related to information, social interaction, and entertainment mainly increase dependence by enhancing the perceived value of the platform. In contrast, information browsing, entertainment consumption, environmental pressure, and low self-efficacy are more closely connected with time perception bias. This distinction helps explain why some students continue using social media because it seems useful, whereas others extend their use because they become absorbed and lose track of time.

5. Discussion

First, information, social, and entertainment needs increased perceived usefulness. This suggests that students evaluate social media as useful when platforms help them obtain information, maintain relationships, and relieve pressure. Perceived usefulness therefore functions as a value-based cognitive mechanism that links user motivations with continued platform use.

This finding is consistent with the logic of technology acceptance theory. For college students, social media is not only an entertainment channel but also an infrastructure for everyday academic and social coordination. When students believe that social media can efficiently support their tasks and relationships, frequent use becomes easier to rationalize. Over time, this rationalized use may

contribute to dependence, especially when students rely on platforms as the first option for communication, information search, and emotional relaxation.

Second, information needs, entertainment needs, and environmental influence increased time perception bias. Information browsing and entertainment consumption can both create immersive usage episodes in which students underestimate elapsed time. Environmental influence, including peer usage and fear of missing information, may further encourage repeated checking and fragmented attention.

This result shows that time perception bias is not produced only by entertainment. Information seeking can also become immersive when students move from one topic to another through recommendation feeds, links, and notifications. Environmental influence intensifies this process because students may feel that remaining connected is necessary for keeping up with peers or avoiding missed information. In this sense, time perception bias reflects a combination of personal motivation and platform-contextual pressure.

Third, self-efficacy negatively affected time perception bias. Students with stronger confidence in goal completion and self-control were less likely to lose awareness of usage duration. This finding highlights the importance of self-regulation in reducing unconscious overuse.

Fourth, perceived usefulness and time perception bias significantly mediated social media dependence. The findings indicate that dependence is formed not only because students regard platforms as useful, but also because they become immersed and unintentionally extend usage time. Time perception bias may be a stronger behavioral mechanism than simple perceived usefulness because it reflects users' unconscious extension of media use and the weakening of real-time behavioral monitoring.

The dual-mediator result has practical meaning. Interventions that only emphasize the risks of overuse may be insufficient if students continue to believe that platforms are useful and necessary. Similarly, interventions that only encourage students to recognize platform value do not address the problem of losing track of time. Effective prevention should therefore combine cognitive guidance, time-feedback design, and behavioral self-monitoring.

6. Conclusion and Implications

This study empirically examined the formation mechanism of college students' social media dependence by integrating the S-O-R and M-O-A models. Based on 287 valid questionnaires and SEM analysis, the results show that perceived usefulness and time perception bias play significant mediating roles. Information, social, and entertainment needs mainly operate through perceived usefulness, whereas information needs, entertainment needs, environmental influence, and self-efficacy operate through time perception bias.

The findings suggest that platform designers should improve time reminders, usage feedback, and interruption-friendly interface functions so that users can better recognize and regulate extended use. Universities should strengthen media literacy education and self-regulation training, helping students evaluate platform value while also monitoring time, attention, and emotional dependence.

For platform governance, the results suggest that time management functions should be more visible, personalized, and difficult to ignore. Usage summaries, cumulative time warnings, and optional rest prompts may help users correct inaccurate time perception. For universities, media literacy education should move beyond general warnings about addiction and teach students how recommendation systems, notifications, and social feedback shape attention and time use.

This study also has limitations. First, the sample is limited to college students and may not represent all user groups. Second, the cross-sectional survey design cannot fully establish causality. Third, future studies may use longitudinal data, experimental designs, or behavioral log data to verify the proposed model and examine how perceived usefulness and time perception bias change over time.

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