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## **An integrated model of the antecedents and consequences of perceived information overload using WeChat as an example**

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**Abstract:** In recent years, more and more social media users have complained of information overload. In this paper, we obtained data from surveys of users of the multi-purpose Chinese social website, WeChat, to develop an integrated model of information overload. The model was used to determine the antecedents and consequences of WeChat users' perceived information overload. A field survey of 244 WeChat users was conducted to test the research model and hypotheses. The results showed the following key findings: 1) the amount of information received and the length of content increased users' perceptions of information overload, while the number of WeChat subscriptions followed was not a significant factor; 2) users' perceptions of information overload were associated with negative emotions and increased intention to discontinue usage; 3) the type and severity of negative emotions and consequent likelihood of discontinuing usage will vary according to the users' different levels of experience. The implications of our results for researchers, website managers and psychosocial practitioners are discussed.

**Keywords:** perceived information overload; PIO; number of subscription follow; NSF; amount of information received; length of information; LOI; negative emotion; NE; discontinuous usage intention; DUI.

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## 1 Introduction

With the development of social media and information technology, the problem of information overload (IO) has attracted the attention of both scholars and web managers. As Bontcheva et al. (2013) reported 21% of British social network site users and 34% of British Twitter users felt that they received too much content from online services. Generally speaking, the term 'IO' refers to the situation where users receive so much information, so quickly, that it exceeds their capacity to process it resulting in dysfunctional consequences such as stress or anxiety and diminished decision-making ability (Swar et al., 2016). Living in a digital society, we are bombarded with information whether or not we actively seek it. We are all affected by the increasing number of sources from which information emanates. Recognising the antecedents and consequences of IO can help us to prevent it or at least deal with it.

In this study, we focused on the most popular social media site in China, WeChat, which was first released in 2011. WeChat provides multiple mobile services including voice messaging, video, pictures and text, circle of friends, a public platform, voice notepad, and other services. Apart from sending texts and pictures in their friend space (*moments*) and voice messaging, one of the most important uses of WeChat is to create and follow subscription accounts that provide articles for users to read. Dissatisfaction with subscription services is one of the chief causes of usage discontinuation. WeChat users add specific subscription accounts, also known as WeChat official accounts, to their platform list so that they can receive relevant articles. These accounts can also 'push' messages and content to users who follow them. Discontinuing accounts simply involves moving them off the list and many WeChat users quit using subscription services when the information load became too great, which caused a huge loss for the WeChat subscription account service (Zhang et al., 2017a). Thus, it is important to explore why users quit using WeChat subscription services.

A review of the literature on social media usage showed that factors influencing IO mainly included the number of friends, number of tweets received (Sasaki et al., 2015; Laumer et al., 2013), information equivocality and information relevance (Lee et al., 2016), while other studies examined the effects of IO in terms of social network fatigue, dissatisfaction with service (Zhang et al., 2016), and intention to discontinue usage (Cao and Sun, 2018). However, the following limitations remain:

- 1 Prior studies mainly focused on Twitter users' IO (Sasaki et al., 2015). The difference between Twitter and WeChat lies in the fact that on Twitter, the number of tweets received depends on the user's number of friends (social interaction motivation) (Sasaki et al., 2016), while on WeChat, the subscription accounts continually push massive numbers of messages and articles (information gathering

motivation) to users. To our knowledge, there have been no investigations of how WeChat subscription accounts affect users' perceptions of IO and what the consequences are.

- 2 Some published work showed a direct link between IO and the likelihood of users discontinuing service (Cao and Sun, 2018; Zhang et al., 2016), but did not explain the process or explore why it happened.
- 3 Most researchers ignored the users' levels of experience on IO and how it affected the chances of discontinuation.

According to Khalifa and Liu (2007), users with different levels of experience often have different skills and knowledge that influence their behavioural intentions. Thus, the following research questions were put forward:

- 1 How do WeChat subscription accounts affect users' perceptions of IO and what are the consequences?
- 2 Does perceived information overload (PIO) affect users' intentions to discontinue usage and if so, how?
- 3 Do differences in levels of experience affect users' intentions to discontinue usage?

Based on the above questions, we proposed an integrated model of the antecedents and consequences of IO as perceived by WeChat users who felt that they were inundated with too many messages. In this study we first investigated how WeChat subscription accounts affect users' perceptions of IO and the consequences. People want and need information but too many inputs can be overwhelming. The results deepen our understanding of the motivations behind information gathering and the consequences. Secondly, we investigated the link between IO and how likely users were to reduce or discontinue usage of the social site. Finally, we found that the experience level of a user had a substantial effect on their disposition to reduce usage or the number of WeChat subscriptions.

## **2 Literature review**

### *2.1 Information overload*

With the rapid development of the internet, a great deal of data has been produced (Li and He, 2015) and consequently the problem of IO has become more widely recognised and experienced. Research on IO has been conducted by investigators in a variety of disciplines including business, computer science, information science, and social science (Chen et al., 2009b; Edmunds and Morris, 2000; Furner and Zinko, 2017). When the amount of data and the rate at which it is pushed at the user exceeds their information-processing ability, an individual may have difficulty identifying relevant information, become overly selective in eliminating content, and experience problems in understanding the association between details and the overall perspective (Eppler and Mengis, 2004). As the means and opportunities for pushing content on social media like WeChat continually increase, more and more users are complaining of IO as a result of their use of such services.

**Table 1** Antecedents and consequences of IO in IS research

<i>Authors</i>	<i>Antecedents</i>	<i>Consequences</i>	<i>Conclusions</i>
Korhonen et al. (2018)	n/a	Choice quality	Information overload affects choice quality.
Bettis-Outland (2012)	Different decision making types.	n/a	Each decision making approach has a different impact on information overload.
Ledzińska and Postek (2017)	n/a	Process of decision making	Information overload leads to information stress, thus hindering the process of decision making.
Zhang et al. (2016)	n/a	Fatigue, dissatisfaction, discontinuous usage intention.	Perceived overload exerts greater effects on social network fatigue than dissatisfaction, both of which further increase users' intention of discontinuance.
Sasaki et al. (2015)	Number of friends, number of tweets received, density of a user's egocentric network.	n/a	The number of friends had a significantly positive effect on perceived tweet overload, while the number of tweets received and density of a user's egocentric network did not produce a significant effect.
Lee et al. (2016)	Information equivocality, and information relevance.	SNS fatigue.	Information equivocality positively influenced information overload. However, information relevance was not a significant predictor of information overload.
Choi and Lim (2016)	n/a	Psychological well-being.	Social and information technology overload affect psychological well-being through SNS addiction.
Sasaki et al. (2016)	Number of friends in Twitter.	n/a	Users who experience information overload modified their usage habits to avoid seeing all received tweets.
Swar et al. (2016)	n/a	Psychological ill-being, behavioural intention.	Information overload had a positive impact on information seekers' psychological ill-being, influencing their behavioural intention to discontinue the use of online healthcare information search.

**Table 1** Antecedents and consequences of IO in IS research (continued)

<i>Authors</i>	<i>Antecedents</i>	<i>Consequences</i>	<i>Conclusions</i>
Cao and Sun (2018)	n/a	Internal psychological states, discontinuous intention.	Perceived information overload has a positive impact on discontinuous intention of social media users through internal psychological states (i.e., exhaustion and regret).
Bock et al. (2010)	n/a	Intention to continue using EKR, satisfaction with the system.	Information overload exerts an indirect and significant negative effect on the intention to continue using EKR by altering perceived usefulness and satisfaction with the system.
Chen (2012)	Complexity and ambiguity of information, number of brand alternatives.	n/a	The results indicated that the complexity and ambiguity of information, number of brand alternatives offered by the information source and system interface all positively affect consumers' perceived information overload.
Saunders et al. (2017)	Polychromic individuals experiences, memories of past emotional and cognitive overload.	n/a	Polychromic individuals' negative experiences and memories of past emotional and cognitive overload positively affect ICT-related overload in the use of mobile phones.
Schmitt et al. (2017)	News consumption, information seeking self-efficacy, information retrieval strategies.	n/a	Motivations for news consumption, information-seeking self-efficacy, and information retrieval strategies affect information overload.
York (2013)	News exposure, news enjoyment.	n/a	News exposure was positively associated with feeling overloaded, while news enjoyment was negatively associated with overload.
Laumer et al. (2013)	Age, number of friends, and communication content.	Satisfaction and continuous usage intention.	Age, number of friends, and communication content are factors of social interaction overload that affect satisfaction and continuous usage intention.
Wei and Ram (2016)	n/a	Perceived usefulness of podcasting.	Information overload negatively affects perceived usefulness of podcasting.

The review of literature on IO in IS research (Table 1) showed that some scholars have explored the factors that produce IO (Sasaki et al., 2015; Laumer et al., 2013), while others have examined the consequences of excessive content (Lee et al., 2016; Zhang et al., 2016). In particular, the number of tweets received, the number of friends, and the density of a user's egocentric network (Sasaki et al., 2015), the equivocality and relevance of the information (Lee et al., 2016), individuals, memories of past emotional and cognitive overload (Saunders et al., 2017), the complexity and ambiguity of messages, and the number of brand alternatives offered by the content source and system interface (Chen, 2012) are all important factors that affect IO in IS research. The consequences of IO in IS research mainly focused on its impact on decision-making (Ledzińska and Postek, 2017), social network fatigue, dissatisfaction (Zhang et al., 2016), intention to discontinue usage (Cao and Sun, 2018), and psychological well-being (Choi and Lim, 2016). Additionally, some scholars have tested strategies to prevent IO (Edmunds and Morris, 2000; Paul and Nazareth, 2010). While several studies have explored Twitter users' IO from the perspective of social interaction (Sasaki et al., 2016), relatively few studies investigated how WeChat users' subscription accounts (information gathering motivation) affected their perception of IO and what the consequences were.

## *2.2 Information processing theory (IPT)*

IPT is a cognitive approach to understanding how humans absorb and utilise information (Atkinson and Shiffrin, 1968). The theory consists of three elements: information processing requirements, information processing capabilities, and the fit between requirements and capabilities (Tushman and Nadler, 1978). This theory views humans as somewhat similar to computers, actively inputting, retrieving, processing, and storing information, and has also been applied to business organisations (Cegielski et al., 2012). IPT postulates that behaviour of social media users can be influenced by the type and magnitude of information input (stimulus), their knowledge and experience, and their capacity for processing data. With the development of mobile social media apps, website operators push more and more content to users while users also generate large amounts of information among themselves. If the volume of incoming data is too great, an individual's capacity to process it will quickly be overtaxed and they will feel overloaded with too much information. How does a WeChat user get to this point and what are the consequences? This paper applies IPT to identify and classify the antecedents and determine the individual consequences of IO for WeChat users.

## **3 Research model and hypotheses**

### *3.1 Stimuli and IO*

Several studies have explored the phenomenon of IO for Twitter users (Sasaki et al., 2016) and Facebook users (Laumer et al., 2013) by considering the number of friends (social interaction motivation) as the main determinant of IO. However, few studies investigated how multi-functional social media services such as WeChat with its user-defined subscription accounts affect users' perceptions of IO and how they respond to it. To fill this research gap, we investigated the factors affecting WeChat users' IO from the perspective of information gathering motivation. Specifically, our study focused on

WeChat subscription accounts, also known as WeChat official accounts, as a platform that can push a large amount of content in the form of messages and articles to users.

Access to interesting and relevant information is one of the key motivations for using social media. However, it is very easy to overdo it and become inundated with more content than one can reasonably absorb. The sources of the information, its amount, frequency and characteristics all have a bearing on the potential for overload (Jackson and Farzaneh, 2012; Sasaki et al., 2015; Laumer et al., 2013). In particular, the sources of content can have marked effects on users' abilities to handle the information (Li, 2016). Familiar hash tags that relate to peoples' interests may motivate them to receive more messages from such sources, whereas for those posting irrelevant hash tags, a relatively few messages can cause negative feelings of overload (Liang and Fu, 2017). Generally speaking, the more different sources a WeChat user subscribes to, the greater the flow of content onto their platform and this can quickly build up to excessive levels (Rhoads, 2010).

Although the type of information clearly influences a media user's impression of overload, the sheer amount of content, whether relevant or irrelevant, contributes to the feeling of drowning in data (Nelson, 1994; Sasaki et al., 2015). Li (2016) even used IO theory to represent the abundance of information received by consumers in online shopping environments. In our context, we confirmed that the amount of information received affected the susceptibility of WeChat users to IO. Finally, basic informational characteristics, such as amount, density and complexity (Plumlee, 2003) as well as more subtle factors such as ambiguity (Schneider, 1987) are also thought to be important determinants of IO. Most studies ignored the effect of content length on users' perceptions, although it clearly contributes to cognitive load (Mikk, 2008). In light of the aforementioned evidence, this paper hypothesised that:

- H1 The number of subscriptions followed has a positive effect on PIO.
- H2 The amount of information received has a positive effect on PIO.
- H3 The length of content has a positive effect on PIO.

### *3.2 Negative emotions (NE) and discontinuous usage intentions (DUI)*

With the burgeoning popularity of social media, more scholars have studied the patterns of use of social media subscribers (Hwang et al., 2016; Opoku, 2017) and their intentions to continue using services at the same level (Wang and Chou, 2016; Zhou, 2013). The term, 'DUI' refers to the likelihood that an individual will change his or her behaviour by reducing their use of a platform's services. Maier et al. (2015b) investigated the factors that induce Facebook subscribers to discontinue use of the social networking service, and they found that stress and exhaustion from overload were major causes. However, the factors affecting WeChat members' intentions to discontinue subscription services are less clear; although, according to Maier et al. (2015a), social overload is strongly implicated in determining users' DUI. Swar et al. (2016) also concluded that PIO negatively affected the psychological state of information seekers and increased the likelihood that they would stop using a social network system. IO leads to discontinued usage – that seems to be clear (Cao and Sun, 2018). Thus, we conclude that our first hypothesis is correct, that subscribing to too many WeChat newsfeeds causes users to feel

overwhelmed by too much content and to cut back on information flow by discontinuing some of their WeChat subscription accounts.

One important aspect of our research is evaluating the role of NE in perceptions of IO. Emotions are characterised as brief experiences associated with the cognitive appraisal of an external stimulus or situation (Lazarus, 1991). An emotion has been defined as “a mental state of readiness that arises from cognitive appraisals of events or thoughts; has a phenomenological tone; is accompanied by physiological processes; is often expressed physically (e.g., in gestures, posture, facial features); and may result in specific actions to affirm or cope with the emotion” (Bagozzi et al., 1999). Emotions can be divided into positive and negative (Brainerd et al., 2008). Prior researches showed that an individual’s perception of data overload is the key determinant of social network fatigue (Zhang et al., 2016). Cao and Sun (2018) proved that internal psychological states reflecting a social media user’s direct perception of being exhausted by excessive content can lead to their reducing or ending their use of a specific media platform. Mental fatigue from media overuse can cause NE that feed back to exacerbate the overload (Smith, 2010). In this study, we found clear evidence of a reciprocal linkage between a user’s feelings of being subjected to IO and the generation of NE.

Previous research has robustly shown that NE discourage users from making purchases on e-commerce sites (Anderson and Agarwal, 2011; Gelbrich, 2010). Some scholars even maintain that decision making without the influence of emotions is impossible (Kim et al., 2016). Site visitors who experience NE are more likely to write negative reviews, lodge complaints, and not return to the site (Hibbeln et al., 2017; Gelbrich, 2010; Tronvoll, 2011). Emotions affect people’s judgments, and NE decrease people’s ability to control their attention (Goldsmith et al., 2012). Thus, we believe that WeChat users’ NE can push them in the direction of deciding to discontinue or reduce social media usage. In view of the aforementioned evidence, we hypothesised the following:

H4 IO has a positive effect on users’ DUI.

H5 IO has a positive effect on users’ NE.

H6 NE have a positive effect on users’ DUI.

### *3.3 The moderating role of level of experience*

Experience in this sense refers to a user’s cognitive and affective state resulting from personal interactions with a website (Samuel et al., 2015). A review of the literature shows that individuals with greater experience in terms of the quantity, type, and organisation of their knowledge are better able to cope with rapid information flows than relatively inexperienced users (Chang and Shen, 2018; Chen et al., 2009a). A high level of experience in a variety of contexts is likely to positively influence a user’s behaviour in relation to satisfaction, intention to revisit, continuing use, and site loyalty (Dong and Shim, 2017; Pappas et al., 2014). People who are skilled in using computers and smartphones tend to find websites easier to use, have less anxiety over uncertainty and ambiguity, and may be better able to handle large amounts of information without feeling overwhelmed. Whether these mechanisms apply to general users experiencing IO is unclear.

Existing research on the moderating influence of experience confirmed that it affected users' use intentions (Yeo et al., 2017). Several studies found that users who had greater knowledge derived from previous experience with social network systems did not perceive ease of use as an important issue and were more likely to develop DUI than less-experienced users (Liébana-Cabanillas et al., 2014). Persons with high level skills and knowledge due to their frequent use of WeChat and its services tended to be more active users and usually followed many WeChat subscription services. They also usually had very clear ideas about which feeds were interesting and useful to them and they wanted to obtain information quickly. When they receive too much information, they were more likely to have negative feelings towards the website and often quit some WeChat subscription services. In contrast, the relatively inactive user with little experience on WeChat followed fewer subscription accounts, and when they receive excess information from WeChat subscription services, they simply ignored it (Sasaki et al., 2016). Thus, they were less likely to experience NE and discontinue WeChat subscription services. Accordingly, we propose that:

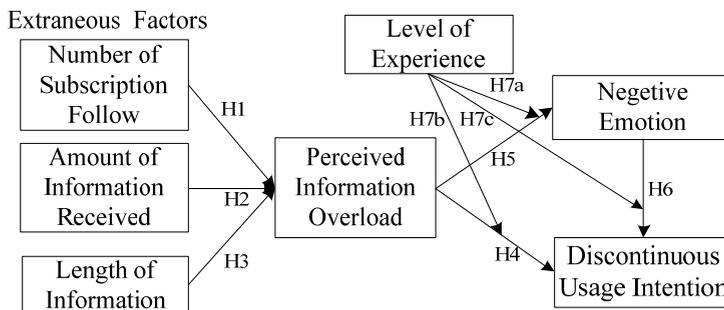
H7a Users' levels of experience act as a positive moderator between IO and NE.

H7b Users' levels of experience act as a positive moderator between IO and DUI.

H7c Users' levels of experience act as a positive moderator between NE and DUI.

Based on the above findings, we proposed an integrated model for this study (Figure 1). The more subscriptions followed, the greater the amount of information received, and the longer the content, the more likely it was that users reported feeling overloaded with information. Furthermore, the stress of PIO may cause users to develop critical NE, and these in turn can escalate their intentions to reduce or discontinue usage of the social network service. Finally, a user's level of computer experience acts as a moderator between IO on the one hand and NE and DUI on the other.

**Figure 1** Research model



## 4 Research methodology

### 4.1 Measurements

The methods for quantitating each variable were adapted from the literature and the measurement parameters and factor loadings are shown in Table 2; four factors of PIO

were taken from Laumer et al. (2013). The scale of NE was taken from Schoefer and Ennew (2005). The scale of DUI was revised from Lee and Ma (2012). Three items of users' level of experience were adapted from Filieri et al. (2015). Additionally, the length of content was measured by the question, "the content (of pushed WeChat subscriptions) is too long." All items were measured on a seven-point Likert scale ranging from 1 (*strongly disagree/unlikely*) to 7 (*strongly agree/likely*). The number of WeChat subscriptions that users followed was determined by the question, "how many WeChat subscription accounts do you follow?" The amount of information received per day was measured by the question, "how many items of WeChat subscription content do you receive per day?"

**Table 2** Construct measuring

<i>Factor</i>	<i>Measure items</i>	<i>Factor loadings</i>
Perceived information overload (PIO)	I receive more messages, notifications, and announcements sent by WeChat subscriptions than I can respond to.	0.804
	I am overextended from the messages, notifications, and announcements sent by WeChat subscriptions.	0.771
	The amount of trivial articles sent by WeChat subscriptions is too high.	0.759
	I receive too many messages, notifications, and announcements sent by WeChat subscriptions.	0.770
Negative emotions (NE)	After seeing a lot of information sent by WeChat subscriptions, I feel angry.	0.871
	After seeing a lot of information sent by WeChat subscriptions, I am in a bad mood.	0.886
	After seeing a lot of information sent by WeChat subscriptions, I feel upset.	0.901
Discontinuous usage intentions (DUI)	I intend to discontinue following WeChat subscriptions rather than continue their use.	0.863
	I plan to discontinue following WeChat subscriptions in the next few days.	0.930
	If I could, I would like to discontinue my following of WeChat subscriptions.	0.874
Level of experience (LE)	Prior to your participation in this study, how would you rate your level of experience in terms of using WeChat subscriptions?	0.859
	Prior to your participation in this study, how would you rate your level of experience in terms of browsing WeChat subscriptions?	0.899
	Prior to your participation in this study, how would you rate your level of experience in terms of reading WeChat subscriptions?	0.892

#### 4.2 Data collection

This paper collected data through a professional questionnaire website in China, with 256 respondents participating in the survey. Among the received questionnaires,

244 were valid and 12 responses were either answered exactly the same or involved participants that did not use WeChat. The final questionnaire asked for demographic information including gender, age, and income, and questions related to users' WeChat usage, including time spent on WeChat, frequency of use of WeChat per day, number of subscriptions followed, and the amount of information received per day. The respondent characteristics and WeChat usage statistics are summarised in Table 3.

**Table 3** Descriptive statistics of respondent characteristics

<i>Demographic variable</i>		<i>Sample size</i>	<i>%</i>	<i>Demographic variable</i>		<i>Sample size</i>	<i>%</i>
Gender	Male	131	53.69	Time used WeChat	3–5 year	98	40.16
	Female	113	46.31		> 5 year	31	12.70
Age	<= 20 years old	2	0.82	Frequency use of WeChat per day	<= 3 times	21	8.61
	21–30 years old	99	40.57		4–7 times	75	30.74
	31–40 years old	101	41.39		8–11 times	54	22.13
	> 41 years old	42	17.21		12–15 times	45	18.44
Education	Senior middle school or below	48	19.67	> 15 times	49	20.08	
	Bachelor's degree	166	68.03	Number of subscription follow	<= 10	37	15.16
	Master's degree or above	30	12.30		10–20	89	36.48
Monthly personal income (RMB)	<= 3,000	27	11.07		20–30	70	28.69
	3,001–5,000	73	29.92		> 30	48	19.67
	5,001–8,000	78	31.97	Amount of information received per day	<= 10	100	40.98
	> 8,001	66	27.05		10–20	80	32.79
Time used WeChat	<= 1 year	16	6.56		20–30	36	14.75
	1–3 year	99	40.57		> 30	28	11.48

As shown in Table 3, 131 of the respondents were male (53.69%), and 113 were female (46.31%). In terms of age, 40.57% were between 21 and 30 years old, and 41.39% of respondents were between 31 and 40 years old. The overwhelming majority of the respondents (68.03%) had a bachelor's degree; 31.97%, the largest proportion, of the respondents had an income of between RMB 5,001 and 8,000 per month, and 29.92% of the respondents had income between RMB 3,001 and 5,000 per month. 40.57% of respondents had used WeChat for one to three years, and 40.16% had used WeChat for three to five years. With regard to use frequency of WeChat per day, 30.74% of respondents used WeChat four to seven times per day, and 22.54% used WeChat 8 to 11 times per day. 36.48% of respondents followed 10 to 20 WeChat subscriptions, while 28.69% followed 20 to 30 WeChat subscriptions. 40.98% of respondents received fewer than ten pieces of WeChat subscription information per day, and 32.79% received 10 to 20 pieces of information per day. Our demographic information including gender, age, education, and income, was basically consistent with the results of the CNNIC (China Internet Network Information Center) survey by the end of December 2017. Thus, our sample was representative of the population of Internet users as a whole.

## 5 Data analysis and results

### 5.1 Measurement validation

SmartPLS2.0 was used to analyse the collected data, and the measurement model was assessed by examining the reliability, convergent validity and discriminant validity. Reliability was assessed by determining Cronbach's alpha, the composite reliability (CR) and the average variance extracted (AVE). According to the suggestions of Hair et al. (2009), Cronbach's alpha was accepted when it exceeded 0.7; CR was accepted when it exceeded 0.7; and AVE was accepted when it exceeded 0.5. The results are presented in Table 4. Cronbach's alpha ranges from 0.782 to 0.868, which exceeds the recommended value of 0.7. CR ranges from 0.858 to 0.919, which exceeds the recommended level of 0.7. AVE ranges from 0.602 to 0.791, which also exceeds the recommended level of 0.5. Thus, the measurement models had high reliability. The convergent validity can be assessed using the factor loadings. All of the factor loadings in this study were higher than 0.759 at the significance level of  $p < 0.01$ , demonstrating good convergent validity. The square root of each factor's AVE was larger than its corresponding correlation coefficients with other factors, indicating adequate discriminant validity (Table 4).

**Table 4** Reliability and validity

<i>Items</i>	<i>AVE</i>	<i>CR</i>	<i>Cronbach's alpha</i>	<i>NSF</i>	<i>IR</i>	<i>LOI</i>	<i>IO</i>	<i>NE</i>	<i>DUI</i>	<i>LE</i>
NSF	1.000	1.000	1.000	1.000						
IR	1.000	1.000	1.000	0.606	1.000					
LOI	1.000	1.000	1.000	-0.113	-0.071	1.000				
IO	0.602	0.858	0.782	-0.090	-0.001	0.718	0.776			
NE	0.785	0.916	0.863	-0.067	-0.064	0.677	0.699	0.886		
DUI	0.791	0.919	0.868	-0.015	-0.017	0.652	0.681	0.757	0.889	
LE	0.781	0.914	0.861	0.295	0.361	0.013	0.144	0.032	0.074	0.884

Notes: Number of subscription follow (NSF), amount of information received (IR), length of information (LOI), information overload (IO), negative emotion (NE), discontinuous usage intention (DUI) and level of experience (LE).

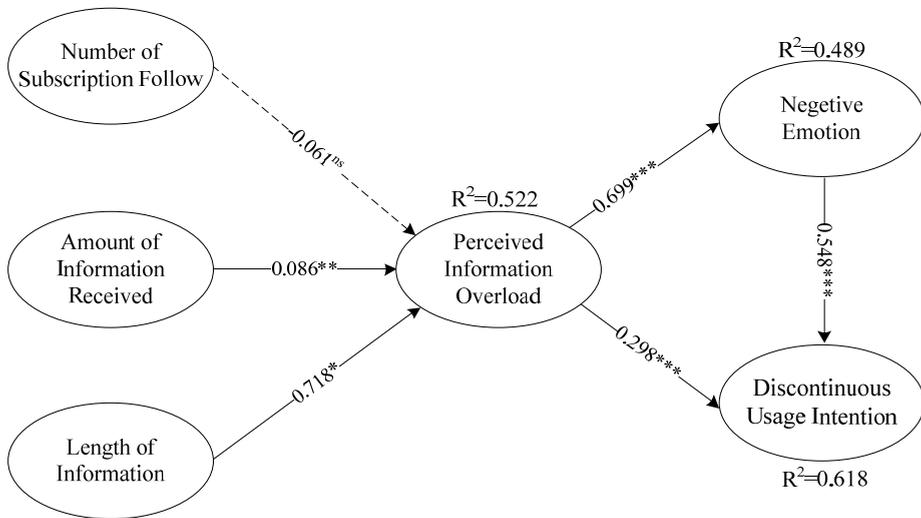
To make sure that the dataset was free from common method bias, an inspection of Harman's single-factor with seven constructs and 16 scale items was conducted. The statistical results indicated no single factor attaining dominance, the highest covariance explained by one factor is 37.620%, which was less than the cut-off value of 50%. Thus, common method bias is not a serious concern.

### 5.2 Structural model assessment

SmartPLS2.0 was used to test each hypothesis in the research model (Figure 2). The effect of the number of subscriptions followed on user's PIO was not significant; thus, hypothesis H1 was not supported. Limitations on the time available to the user and their abilities prevented them from reading all the content sent by WeChat subscription

services. When there is a lot of content, many users will only read the relevant material (Sasaki et al., 2016), ignore the pushed messages and not report IO. In general, however, if the average length of each item increases and the total amount of information received doubles or triples, then users will experience IO. Thus, hypotheses H2 and H3 were supported. IO provoked NE that can lead users to cut back on their social internet usage. Thus, hypotheses H4 and H5 are valid. The more IO that users perceived, the more likely they were to feel NE and discontinue usage. Thus, hypothesis H6 was supported, and users reporting the most NE to the site experience were more likely to reduce the number of WeChat subscription services they had been following. R-squared values were also calculated and recorded in Figure 2.

**Figure 2** Results of structure model analysis



Notes: \*\*\*p < 0.001, \*\*p < 0.01 and \*p < 0.05.

### 5.3 Mediating effect of NE

A bootstrap method was used in this study to test the effect of NE on users' perceptions of IO and their intentions to discontinue usage. This method, which involves a process of repeated sampling with a return, can be used to reflect the statistical sampling distribution and can also approximate the confidence interval which is used to judge the significance of the mediator effect (Wang and Li, 2003). The PROCESS SPSS macro developed by Hayes (2013) was used together with the bias-corrected method and the percentile method to test the mediating effect. When the confidence interval that is measured by the bias-corrected method or the percentile method does not include zero, the statistic has an intermediary effect (Hayes, 2013). Table 5 shows that all of the T-values are greater than 1.96, and the confidence intervals of the bias-corrected method and percentile method do not include zero. Thus, NE act as partial mediators between users' perceptions of IO and their DUI.

**Table 5** Results of mediating effects

<i>M/(IV)/(DV)</i>	<i>Items</i>	<i>Effect</i>	<i>Coefficient</i>		<i>Bias-corrected</i>		<i>Percentile</i>		<i>Effect</i>
			<i>SE</i>	<i>T</i>	<i>95% CI</i>		<i>95% CI</i>		
NE/(IO)/(UI)	Direct effect	0.260	0.056	4.669	0.150	0.369	0.150	0.369	Partial
	Indirect effect	0.395	0.054	7.315	0.299	0.507	0.294	0.503	

Notes: Bootstrap 5,000 times, IV: independent variable; M: mediator; DV: dependent variable.

#### 5.4 Moderating effect of experience

A multiple hierarchical regression method was used to test the moderating effect of experience (Zhang et al., 2017b). Before conducting the analysis, the Anderson-Rubin method was used to calculate factor scores for all constructs to make them centre to zero (Ma et al., 2017). The results support the hypothesis that IO significantly intensified NE (model 1, Table 6). When we tested the parameter of level of experience in the model, we found no significant effect on NE (model 2, Table 6). However, when we put the interaction effect of level of experience into the model, the parameter estimate for the interaction term (IO with level of experience) was significantly positive ( $\beta = 0.122$ ,  $t = 2.481$ ,  $p < 0.05$ , one-tailed) for NE (model 3, Table 6). Thus, H7a was supported and level of experience was shown to positively moderate the relationship between PIO and NE (Table 6 and Figure 3). The reason may be that experienced users of WeChat and its services often possess greater skills and knowledge and consequently may be overconfident in their abilities to track a greater number of WeChat subscriptions than novices. When they receive too much information they feel frustrated and betrayed and will be more likely to experience fatigue (Zhang et al., 2016), exhaustion (Cao and Sun, 2018), and NE.

**Table 6** Moderating role of experience between IO and NE

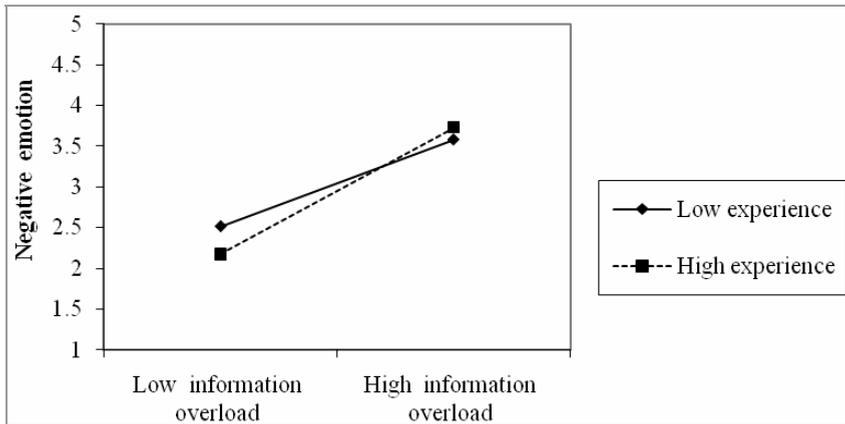
<i>Items</i>	<i>Model 1</i>		<i>Model 2</i>		<i>Model 3</i>	
	$\beta$	<i>T-value</i>	$\beta$	<i>T-value</i>	$\beta$	<i>T-value</i>
Information overload	0.685	14.617	0.696	14.716	0.656	13.280
Level of experience			-0.072	-1.513	-0.048	-0.997
IO $\times$ LE					0.122	2.481
Adjusted R-square	0.467		0.470		0.481	
R-square change	0.469		0.005		0.013	
F-change	213.664***		2.290		6.154*	

Notes: \*\*\* $p < 0.001$ , \*\* $p < 0.01$  and \* $p < 0.05$ .

Our data are consistent with the hypothesis that IO positively and significantly affects users' DUI (model 1, Table 7). When we put the level of experience into the model, however, its effect on users' DUI was not significant (model 2, Table 7). When we put the interaction effect of level of experience into the model, the parameter estimate for the interaction term (IO with level of experience) was significantly positive ( $\beta = 0.161$ ,  $t = 3.156$ ,  $p < 0.05$ , one-tailed) for users' DUI (model 3, Table 7). Thus, H7b was supported: that experience positively moderates the relationship between PIO and users'

DUI (Table 7, Figure 4). One reason for this finding may be that experienced users are better able to identify the content that is useful to them and they expect that information to be delivered quickly and succinctly. When excessive information is pushed on them by WeChat subscriptions, they are quicker to ignore or discontinuous usage than less experienced users (Sasaki et al., 2016).

**Figure 3** Moderating effect of experience between IO and NE



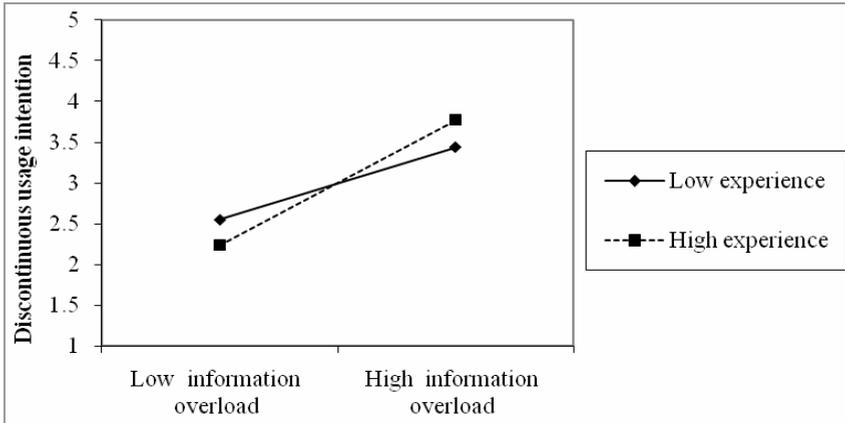
**Table 7** Moderating role of experience between IO and DUI

Items	Model 1		Model 2		Model 3	
	$\beta$	T-value	$\beta$	T-value	$\beta$	T-value
Information overload	0.654	13.456	0.658	13.361	0.606	11.864
Level of experience			-0.026	-0.526	0.006	0.112
IO $\times$ LE					0.161	3.156
Adjusted R-square	0.426		0.424		0.445	
R-square change	0.428		0.001		0.023	
F-change	181.070***		0.277		9.959**	

Notes: \*\*\* $p < 0.001$ , \*\* $p < 0.01$  and \* $p < 0.05$ .

Our results show that in the main, NE positively and significantly affect users' DUI (model 1, Table 8). However, when the level of experience was put into the model, its effect on users' DUI was not significant (model 2, Table 8). When we put the interaction effect of level of experience in the model, the parameter estimate for the interaction term (NE with level of experience) was significantly positive ( $\beta = 0.106$ ,  $t = 2.248$ ,  $p < 0.05$ , one-tailed) for users' DUI (see model 3 in Table 8). Thus, H7c was supported: that experience positively moderates the relationship between NE and users' DUI (Table 8, Figure 5). When experienced users suffer NE, they know what to do from past experience and simply discontinue usage to alleviate overload stress. This conclusion was also supported by Liébana-Cabanillas et al. (2014), who found that users that have acquired greater knowledge through practice and experience, were more likely to generate DUI than less sophisticated social media users.

**Figure 4** Moderating effect of experience between IO and DUI

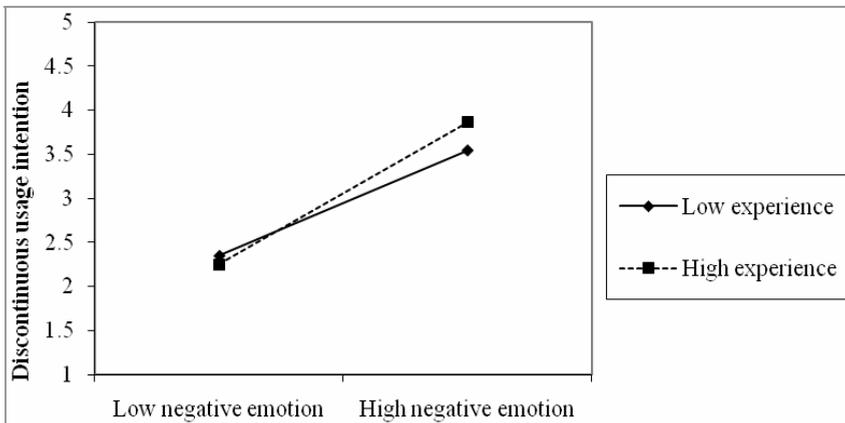


**Table 8** The moderating role of experience between NE and DUI

Items	Model 1		Model 2		Model 3	
	$\beta$	T-value	$\beta$	T-value	$\beta$	T-value
Negative emotion	0.754	17.860	0.752	18.822	0.703	14.883
Level of experience			0.048	1.145	0.056	1.322
NE $\times$ LE					0.106	2.248
Adjusted R-square	0.567		0.567		0.575	
R-square change	0.569		0.002		0.009	
F-change	318.978***		1.311		5.052*	

Notes: \*\*\* $p < 0.001$ , \*\* $p < 0.01$  and \* $p < 0.05$ .

**Figure 5** Moderating effect of experience between NE and DUI



## **6 Discussion**

### *6.1 Key findings*

The purpose of this study was to examine:

- 1 how WeChat subscriptions affect users' PIO
- 2 how PIO affects users' DUI
- 3 whether differences in level of experience can alter WeChat users' DUI.

Based on these questions, a field survey with 244 WeChat users was conducted to test the research model and hypotheses and some key findings were revealed by this empirical research.

First, the greater the number of informational items received per day and the longer, less relevant and more complex they are, the more likely it is that a user will feel overloaded with too much content. For WeChat users, however, subscribing to and following a greater number of accounts did not significantly contribute to perceptions of IO. Although users may follow many WeChat subscriptions, when too much content is pushed onto their dashboard they will simply ignore or delete it. Sasaki et al. (2016) collected objective data on Twitter users such as numbers of friends and subjective data such as PIO and found that users who felt overwhelmed by too many tweets responded by modifying their usage habits to avoid seeing all received tweets. In this study, we took the hypothesis a step further and demonstrated that length of content and amount of information received were important factors affecting users' PIO.

Secondly, the results of this study showed that users' perceptions of IO had a positive effect on users' DUI through users' NE. This implies that perceptions of IO generate NE such as anxiety and frustration that may cause users to discontinue following WeChat subscriptions. By analysing 258 Chinese social media users, Cao and Sun (2018) proved that PIO caused social media users to suffer negative internal psychological states such as feelings of exhaustion and that these conditions increased their intentions to discontinue social media interactions. This paper further found that PIO by WeChat users led to NE that made them more likely to decrease usage by deleting some number of subscriptions.

Finally, we demonstrated that a user's level of experience acted as a positive moderator between IO and NE, between IO and DUI, and between NE and DUI. This study confirmed that users with high levels of experience, knowledge and skills tended to generate more NE and greater DUI under the same level of PIO than less knowledgeable users.

### *6.2 Theoretical implications*

This paper contributes to IPT by applying it to explore WeChat users' IO behaviour from the perspective of information gathering motivation. IPT views humans as actively inputting, retrieving, processing, and storing information. In our context, extraneous factors such as the amount of information received can be regarded as inputting, and PIO can be regarded as processing; users' DUI can be seen as storing information. We also found that length of information (LOI) and amount of information received increased

users' perceptions of IO, while the effect of number of subscriptions followed on users' perceptions of IO was not significant.

Our study extends the IO model by introducing new variables such as NE into the influence process. Sasaki et al. (2016) proved that Twitter users who experience IO modified their usage habits to avoid seeing all received tweets. Here we found a clear connection between PIO, the generation of DUI and the consequent modification of usage habits. More importantly, we found that PIO affected users' DUI through heightening of NE.

Finally, this study extends the IO model by discovering new moderating variables such as a user's level of experience. Prior research confirmed that users' intentions differed according to their relative expertise in different contexts (Koo, 2016; Yeo et al., 2017), but whether these mechanisms were applicable in the context of IO was not explored. Our study confirms that under conditions of PIO, users' DUI differ according to their relative level of experience. Additionally, we found that users with higher levels of experience were more likely to generate NE and DUI at the same levels of PIO than less experienced users.

### *6.3 Practical implications*

Practitioners will find that the results of this research provide some insights for WeChat subscription operators and could help them attract more customers and retain existing customers. First, according to our research, the quantity and length of content received every day are important factors affecting users' PIO. Thus, for WeChat subscription operators, a primary task would be to check the length of content that is pushed and its frequency. They should also simplify the pushed content, provide working titles, and limit the daily information load. Everyone's time is limited and once WeChat users perceive IO, they will stop following some WeChat subscriptions.

Second, it is interesting to find that PIO affected users' DUI through NE. Thus, WeChat subscription operators should investigate methods for reducing users' perceptions of IO. For example, WeChat could sort and break the pushed text. It would also be a good idea to build an interactive community and communicate with users to develop an understanding of their needs and preferences. Additionally, WeChat Subscription operators should develop better ways to manage users' emotions and do more to generate positive user emotions. When users generate positive emotions, they are more likely to continue following WeChat subscriptions.

Third, the level of experience of users is an important factor in how they cope with excess information and one that WeChat subscription operators should consider when pushing content on subscribers. We found that a high level of experience among users was more likely to produce NE and to generate DUI in response to excess content in comparison to users with less experience exposed to the same level of IO. Thus, dividing users into two groups that include high and low experience levels might be a wise practice. Additionally, WeChat subscription operators should create different marketing strategies and push mechanisms for users with different experience levels.

Finally, the implications of our study do not stop at investigating factors affecting users' PIO. The ultimate goal is to suggest ways to best maintain a long-term cooperative relationship with social media users. Our findings will be useful to social media public account operators for developing procedures to attract and retain users.

#### 6.4 Limitations and future research

Like other empirical studies, there are limitations to this study that should be acknowledged. First, this paper mainly focused on WeChat subscription accounts. To address the concern of generalisability, future research should consider the characteristics of other social media platforms and other services on WeChat. Second, due to practical constraints, this study was mainly based on cross-sectional data. Future studies can gather tracking data from the WeChat system to gain a better understanding of how WeChat subscription accounts affect users' PIO and what the consequences are. In addition, this paper mainly focused on the effect of PIO on users' DUI through NE. In order to develop a better understand of the ways in which PIO affects users' DUI, some other mediating variables should be examined. Finally, although users' DUI are a key consequences of PIO, future work should include other antecedents and consequences of PIO, such as how personal characteristics affect IO and how IO affects users' psychological states.

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