Original Music Album Diffusion Sustainability in Social Network-Based Communities: A Network Embedded Perspective

GENQIANG LI[1,2] AND RENJING LIU[2]
[1]School of Psychology, Xinxiang Medical College, Xinxiang 453003, China
[2]School of Management, Xi'an Jiaotong University, Xi'an 710048, China

Corresponding author: Renjing Liu (renjingl@163.com)

ABSTRACT An original music album is a collection of music created by an online musician, and is a special form of User Generated Content. This paper aims to identify the factors that drive original music album diffusion in online music community. Based on information acceptance theory and social networking, this study constructed a diffusion model of original music albums. To empirically test the theoretically driven hypotheses, the study uses two-stage data from albums and musicians from NetEase Music, one of the most popular online entertainment communities in China. The findings suggested that album created days, musician network degree, album subscription quantity, and album forward quantity had significant positive effects on diffusion sustainability. Musician network embedding had a significant positive effect on diffusion sustainability. There was an inverted u-shaped relationship between album music quantity and diffusion sustainability.

INDEX TERMS Network embedding, social network services, music community, diffusion processes.

I. INTRODUCTION

In the era of mobile Internet and social networking, ordinary users can create content and share it on network platforms. Content that is created and shared on social networks is known as user-generated content (UGC). UGC sharing networks, in which members are content contributors as well as users, have had a significant impact on the sharing economy and society via the distribution and reuse of their contents [1]. Digital service providers have begun to amass large user bases, increasingly offering primary sources of digital music streaming on the Internet. Innovations, including digitalization and the Internet itself, have transformed the music landscape over the past decade and attracted new artists and listeners. Furthermore, digital music streaming services have profoundly reshaped user behavior. China has followed this global trend and become a leader in terms of digital music services. With the rapid development of social networks, more people spend significant proportions of time engaged in online communities, such as online video sharing or music platforms. For example, NetEase Music (http://music.163.com) is one of the most popular online entertainment communities in China and has

attracted millions of users. NetEase Music is also one of the highest-trending music streaming providers in China, and users can create multiple playlists to collect songs. Users are also able to follow others on the platform, such as friends and artists; therefore, this music platform has become a new and prosperous social network. NetEase Music provides abundant information on users, playlists, and music as user information is public, enabling users to view others' lists of followers and who they follow.

For UGC platforms, research regarding how users are motivated to contribute to UGC and the relationship between UGC behavior and social network characteristics has practical significance. Existing research on UGC has primarily focused on several aspects: motivation to create UGC; the diffusion effect of UGC, and the research conducted on UGC on social networks. In terms of motivation to create UGC, studies have found that altruism, self-image enhancement, and time cost have significant effects on users' willingness to comment online. Furthermore, product involvement, self-improvement, and economic incentives have significant effects on online word-of-mouth (WOM) activity. Meanwhile, trust, reciprocity, and self-efficacy have significant effects on users' willingness to share knowledge [2]. The second focus of research is the diffusion effect of UGC. Information diffusion in social networks has

The associate editor coordinating the review of this manuscript and approving it for publication was Chao Shen.

received much attention in recent years [3]. UGC, promoted by online WOM marketing and product reviews, can increase product sales. Relevant studies posited that this increase in sales could be due to the forwarding behaviors for positive comments [4]. In terms of research conducted on UGC on social networks, the centrality of social networking reflects the influence of users on that network. Relevant studies have used degree centrality to describe the position of users in cooperative networks [5], or to depict the connectivity of social networks [6]. Generally, users with a high degree of network connectivity are considered to have the strongest influence.

Original music albums are a special kind of UGC; however, recent research on UGC has focused more on online reviews than original music albums. Traditional music classifications are divided by the music's genre, age, language, and other factors. Original music albums are a collection of music created by musicians and shared on a platform for other users to listen to. Original music albums on NetEase Music are freely created by musicians but are different to the UGC of online comments or WOM. Based on information acceptance theory and social network theory, this study constructed a diffusion model of original music albums and examined the influence of the characteristics of original music albums and musicians on album diffusion sustainability.

II. RELATED WORK

The network economy is increasingly dependent on creativity. With the technological advances provided by Web 2.0, users can creatively share UGC in online communities. UGC can be divided according to user type into rational users (e.g., knowledge sharing), perceptual users (e.g., social activities, entertainment), group collaboration (e.g., Wikipedia), and individual creation (e.g., blogs, reviews) [7]. Online communities can be divided into trading communities, interest communities, fantasy communities, and relationship communities. Traditional UGC research has focused primarily on online reviews and electronic word-of-mouth (eWOM) in trading communities. Thus, UGC has multiple research areas and can be divided into four categories: users' participant motivation [8], the influence of content [6], content mining [9], and content management [10]. In these studies, online reviews [11] and eWOM [12] are the most common foci, along with reviews released by consumers [13] and consumers' perceived value of reviews [14]. Furthermore, the helpfulness of online reviews is one important aspect of UGC research in fields of study related to business. The helpfulness of online reviews refers to identifying reviews useful in assisting consumer purchase decisions.

Until recently, empirical research addressing questions regarding music listening factors depended primarily on interviews and surveys conducted in controlled environments [15] with inevitable limitations in both data scale and granularity. At present, the technological and societal evolutions that have sustained the emergence of online music have provided unparalleled opportunities for understanding human behavior. Detailed digital footprints, including where, when, and how individuals listen to music, can be regarded as a big-data window through which music listening can be collectively or individually probed and rigorously studied. For instance, NetEase Music provides a high-quality music streaming service to millions of users while continuously accumulating detailed records on the behavior of these users. Specifically, NetEase Music provides a domain-specialized social network through which users can engage by sharing their music-related interests. Like other online social networks, users can create a personal network by following others, both ordinary users and musical artists. Thus, the social network centers on music listening and facilitates the acquiring and sharing of music interests, creating an ideal convergence of social ties and music listening for the present study.

Although music is a prominent element of daily life that possesses cultural universality [16], music listening is rarely explored in the context of social networks. In fact, individuals using social networks come across music from varying categories, genres, languages, and moods, and are continually judging whether they like the music they find. In addition, music is frequently shared with family members, friends, and other people in social networks. Before the worldwide expansion of Internet usage, CDs and cassettes were the primary media available for recording music. As a result, music communication was somewhat limited. In the last twenty years, however, with the prosperous development of the Internet, portable music players have exploded in popularity, essentially promoting music communication [17]. Friends have become willing to exchange iPods and music streaming platforms offer low-latency access to large-scale music databases. Such databased include Spotify, Last.fm, QQ Music [18], and NetEase Music [19]. Since these developments in music communications, people have exchanged music with each other online, and music has, in turn, created interpersonal bonds between individuals [20].

III. RESEARCH MODEL AND HYPOTHESIS
A. RESEARCH MODEL
The information acceptance model was developed on the basis of the Technology Acceptance Model (TAM), which has been used to study the influence of information sources and the usefulness of information itself [21]. Information acceptance theory proposes that when product quality information is asymmetrical, consumers tend to reduce the uncertainty of their decision-making through searching for online reviews and other methods of learning about the product [21]. The information acceptance model considers that the information's content and source are important factors affecting users' acceptance of that information. For online communities, users' perception of the information's quality can be measured by the information itself and by its sources. Information source commonly refers to the publisher of the information. When the publisher is considered trustworthy,
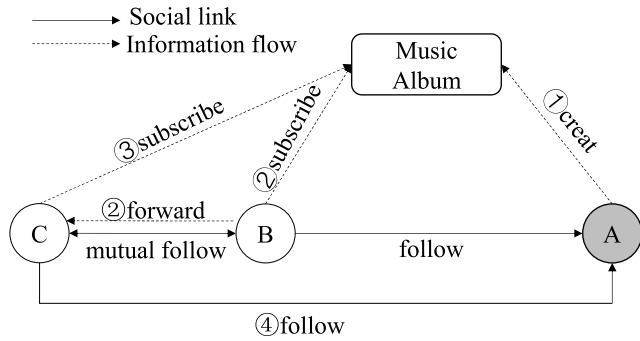
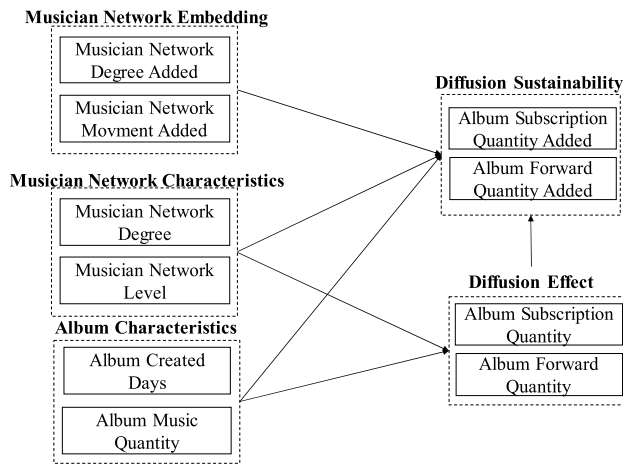**FIGURE 1.** Information flow and social link in music community.

FIGURE 2. Conceptual model.

the information source is considered to display characteristics associated with trustworthiness. According to a report released by Iresearchchina.com 2018, the interactive behavior of Chinese digital music users on music platforms tends to be diverse. Forwarding and commenting are the main forms of interaction behavior, respectively accounting for 75.4% and 73.2% of the actions of digital music consumers.

Figure 1 shows the process of information flow and the social link evolution in the music community. In the initial stage, users B and A have a directional link, and C and B have an indirect link; that is, B is a follower of A, and C and B have a mutual relationship. Step ①: A creates and publishes the original music album in the music community. Step ②: B follows A, and therefore when A releases an original music album on the platform, it is easier for B to know about its release; thereafter, B will listen, subscribe, or forward the album. Step ③: when B forwards the album to friend C, C will either listen, subscribe, or forward the album. Step ④: C may set up a link with A after listening to the album. The social network relationship and the album's diffusion have a dynamic relationship that affects each other. The social network degree of music album creators may increase with the music albums diffusion process; therefore, as this occurs, the music albums experience more diffusion effects.

Album and musician characteristics are assumed to influence the original music diffusion effect and diffusion sustainability. Figure 2 shows a conceptual model of these factors,

including musician network embedding and diffusion sustainability measured by the added value between two-stage data. The factors making up the conceptual model are: measures of musician network embedding constructed by musician network degree added and musician network movement added; measures of diffusion sustainability constructed by album subscription quality added and album forward quality added; measures of album characteristics constructed by and album days created along with album music quality.

B. HYPOTHESIS DEVELOPMENT

Network embedding theory posits that the influence of social relations on behavior is one of the classic problems pondered by social theory [22]. Embedding, as an important channel for the efficient transfer of relational network resources, plays a decisive role in the efficiency of network member resources and information acquisition. The network embedding theory hypothesizes that the network location and strength of user intra-network relationships will affect individual behavior [23]. In the social media era, embeddedness has been effectively applied to the use of business models. For example, to enhance the interaction between users, platforms provide users with online reviews, online dating, and online chat functions [24]. Network embedding is the basic index for analyzing the individual characteristics present in social networks. Social network theory suggests that users with higher network embeddedness often play an important role in the network's functioning as their published content is shared quickly and broadly. This study's first research hypothesis is proposed as follows:

Hypothesis 1: Network embedding positively influences album diffusion sustainability.

The expectation validation model posits that expectation validation positively affects perceived usefulness and satisfaction, while satisfaction positively affects continuous use intention [25]. Information dissemination and acceptance theory suggests that, when product quality information is asymmetrical, consumers need to reduce the uncertainty of their decision-making through online review searches and learning [21]. For NetEase Music, the number of times an album has been played is an important indicator that the original music has been positively accepted by users. The higher the number of times an album is played, the better the album diffusion effect, partly because users can subscribe to an original music album, which can lead to repeated listening on future occasions. The diffusion sustainability of original music albums is measured by subscription quantity and forward quantity. Meanwhile, the diffusion effect is measured by album listening quantity. Commonly, the larger the number of subscriptions and forwarding quantities, the more people will listen to the original music album in the future. In addition, the diffusion sustainability of original music albums is closely related to the diffusion effect. This study focuses on the influencing factors of the diffusion effect of original music albums. Based on these premises, we proposed the following hypothesis:

Hypothesis 2: Album diffusion effect positively influences album diffusion sustainability.

Information quality is the persuasive strength of information, including its relevance, accuracy, and completeness [26]. The more quickly comments are posted after publishing online, the more of these comments will be read because they have been on the website for a longer period of time [27]. At present, although many online platforms display post's comments using different ranking rules, the publication date of comments is still the most important ranking method. Generally, the earlier an album is released, the more times it is browsed and played by users. Thus, based on the days since album creation, we proposed the following hypotheses:

Hypothesis 3a: Album created days positively influences album diffusion effect.

Hypothesis 3b: Album created days positively influences album diffusion sustainability.

As more content is created, the quality of online content lacks uniformity, which creates some difficulties for users searching for, and accepting, information. "Information overload" is the description given to the phenomenon; so much information is attended to by the human brain that it becomes almost impossible to process it all [28]. Original music albums are created by users, and the number of songs included on each album is not limited. Related research regarding information overload has suggested that too much, or too little, information will have a negative impact on the usefulness of UGC. In the present study, the number of songs is regarded as the amount of information an album contains (album quantity). In order to explore the influence of album quantity on album diffusion sustainability and the diffusion effect, the following research hypotheses are proposed:

Hypothesis 4a: Album music quantity has an inverted u-shaped effect on album diffusion sustainability.

Hypothesis 4b: Album music quantity has an inverted u-shaped effect on album diffusion effect.

The rapid development of online social platforms allows people to interact face-to-face and to rely on the Internet as a resource for information exchange [29]. The wide availability of online social network services has engaged users and encouraged them to share information while also increasing the ability of individuals to diffuse information [3]. Network centrality is the basic index to analyze the individual characteristics of social networking. Centrality can be divided into indegree centrality and outdegree centrality. Personal information, peer acceptance, real identity, and residence information commentators can interact with the content usefulness [30]. Highly accessible and centralized users often play an important role in social networks, as their published content can be browsed by a wider range of users and the content is considered trustworthy. Node degrees in online social networks usually have power-law distributions, which have been studied and confirmed for many networks. In the field of online behavior, research suggests that when analyzing network structures, such as the impact of network level on consumer behavior, economic value can be allocated [31].

TABLE 1. Information for top 10 subscription original music albums.

Album ID	Subscription Quantity	Forward Quantity	Music Quantity	Listening Quantity
527194581	1012000	1325	68	3440000
348455050	618000	1248	130	1420000
337895050	469000	1053	51	2180000
527028599	434000	774	91	2635000
346002064	413000	672	116	1795000
527085581	401000	507	23	2150000
527101677	376000	750	64	2893720
676607573	363000	682	29	3365000
340383065	314000	629	23	2895000
340459076	275000	1047	103	730000

Therefore, based on the network indegree and network level, we propose the following hypotheses:

Hypothesis 5a: Musician network degree positively influences album diffusion sustainability.

Hypothesis 5b: Musician network degree positively influences album diffusion effect.

Hypothesis 6a: Musician network level positively influences album diffusion sustainability.

Hypothesis 6b: Musician network level positively influences album diffusion effect.

IV. METHODOLOGY

A. ORIGINAL MUSIC ALBUMS

NetEase Music was officially released on April 23, 2013. Compared with other music platforms, NetEase Music focuses more on music-related socialization and creates a music-based community with UGC. In particular, its music comment function attracts many users. NetEase Music Originality Radio is an important platform for the creation and diffusion of original music. The characteristics of three of its aspects made NetEase Music original albums suitable for the sample selection of this study. First, original music played on the NetEase radio is a typical form of UGC. Users create original music and publish this music publicly on the platform. Second, NetEase Music has online social functions through which each user can participate in by creating a personalized module. Users can add friends to the online platform and follow their music listening dynamics. Third, with NetEase Music, users can not only listen to original music but also distribute original music widely using the subscription and forwarding functions.

"Original Music" is the top radio category on the NetEase Music platform. This radio includes the categories song dubbing and original music. It is forbidden to upload non-original music to NetEase Music. Table 1 shows information regarding the top 10 subscription original music albums.

B. VARIABLE MEASURE

The variable measurement method of this study is shown in Table 2.

TABLE 2. Variable measurement method.

	Variable	Measurement Method
Album Characteristics	Album Created Days (ACD)	Release time of the first song on album
	Album Music Quantity (AMQ)	The number of original songs on the album
Musician Characteristics	Musician Network In-Degree (MND)	The number of followers the musician has
	Musician Network Level (MNL)	The network level of the musician
Network Embedding	Musician Network Degree Added (MDA)	The increased number of followers over two stages
	Musician Network Movement Added Quantity (MMA)	The increased number of movements posted by the musician over two stages
Diffusion Effect	Album Subscription Quantity (ASQ)	Number of subscriptions to the album
	Album Forward Quantity (AFQ)	Number of times the album was forwarded
Diffusion Sustainability	Album Subscription Quantity Added (ASA)	The increased album subscriptions over two stages
	Album Forward Quantity Added (AFA)	The increased forward numbers of the album over the two stages

Musician characteristics were primarily measured by musician network degree and musician network level. Album characteristic were measured by days since album creation, album creation stagnation, and album music quantity. Diffusion sustainability was measured by subscription quantity and forward quantity. Diffusion effect was measured by album listening quantity.

C. DATA COLLECTION

This study used crawler software to obtain the data regarding original music albums on the NetEase Music platform. The first step was to capture the musicians' characteristics, including musician network degree and musician network level. The second step was to capture the album characteristics, including the days since album creation, the number of songs on the album, album subscription quantity, forward quantity, and listening quantity. The third step was to match the album information with the musician's information.

The data were crawled in two stages on June 1, 2019, and December 1, 2019, giving an interval of six months. In the first stage, 904 albums were crawled, comprising 56,406 songs created by 886 musicians. The average number of songs per album was 62. The number of albums crawled for the second stage was 881 (some of the albums and creators' data were missing in the second stage). Using data cleaning and two-stage data matching, 845 final valid data points were obtained.

D. DATA ANALYSIS

As shown in Figure 2, the indegree centrality distribution of musicians in the first stage indicates that most users had low centrality and only a few users had high centrality. This indicates that the NetEase Music social network embodies the power-law distribution of node degree. Figure 2 also shows that most of the musicians had a medium network level, but

TABLE 3. Correlation analysis.

	1	2	3	4	5	6	7	8	9	10
1 ASA	1									
2 AFA	.838***	1								
3 ASQ	.443***	.629***	1							
4 AFQ	.392***	.613***	.847***	1						
5 MDA	.333***	.311***	.467***	.363***	1					
6 MMA	.089***	.085**	.046	.040	.103***	1				
7 MND	.355***	.394***	.581***	.464***	.866***	.102***	1			
8 MNL	.025	.024	.026	.047	.029	.078**	.039	1		
9 ACD	-.007	-.007	.103***	.187***	.062*	.044	.122***	.113***	1	
10 AMQ	.048	.048	.030	.065*	.005	.033	.038	.007	.105***	1

Note: *** means p < 0.01, ** means p < 0.05, * means p < 0.1 (the same below).

TABLE 4. Influencing factors of diffusion sustainable.

	ASQ			AFQ		
	M1	M2	M3	M4	M5	M6
ACD	.103***			.187***		
AMQ		.164**			.329***	
AMQ^2		-.149**			-.293***	
MND			.582***			.463***
MNL			-.010			.024
F	8.969***	2.175	214.948***	30.446***	8.912***	115.640***
R^2	.011	.005	.338	.035	.021	.215
ΔR^2	.009	.003	.336	.034	.018	.214

few had either a very high or very low network level. Thus, the musician network level of NetEase Music demonstrated the characteristics of a normal distribution.

Table 3 shows the results of a correlation analysis of variables. This analysis showed a high correlation between some variables (ASQ and AFQ). In order to avoid the influence of multiple collinearity on the results, the variables with high correlations were entered into the model separately in the regression analysis.

V. RESULTS

A. FACTORS INFLUENCING DIFFUSION EFFECT

Table 4 reports the regression results of original music album characteristics and musician characteristics on diffusion effect. From the viewpoint of album subscription quantity, in Model 1 (M1), the days since album creation had significant positive effects on ASQ ($\beta = 0.103$, p < 0.01). This showed that the earlier the first song from an album was released, the more subscriptions the album would get. In M2, album music quantity squared (AMQ^2) had significant negative effects on ASQ. This showed that albums with a moderate number of songs could get more subscriptions. In M3, the regression coefficient of network degree on ASQ was 0.582, but the regression coefficient of MNL on ASQ was not significant. This indicated that the more fans the musician has in the online community, the more subscriptions the album received.

For album forward quantity (AFQ) in M4, the days since album creation had significant positive effects on the forward quantity ($\beta = 0.187$, p < 0.01). This showed that the earlier the first song from an album was released, the higher AFQ was. In M5, album music quantity squared (AMQ^2)

(a) Description of Playlist Subscription Quantity

(b) Description of Forward Quantity

(c) Description of Musician's Network Indegree

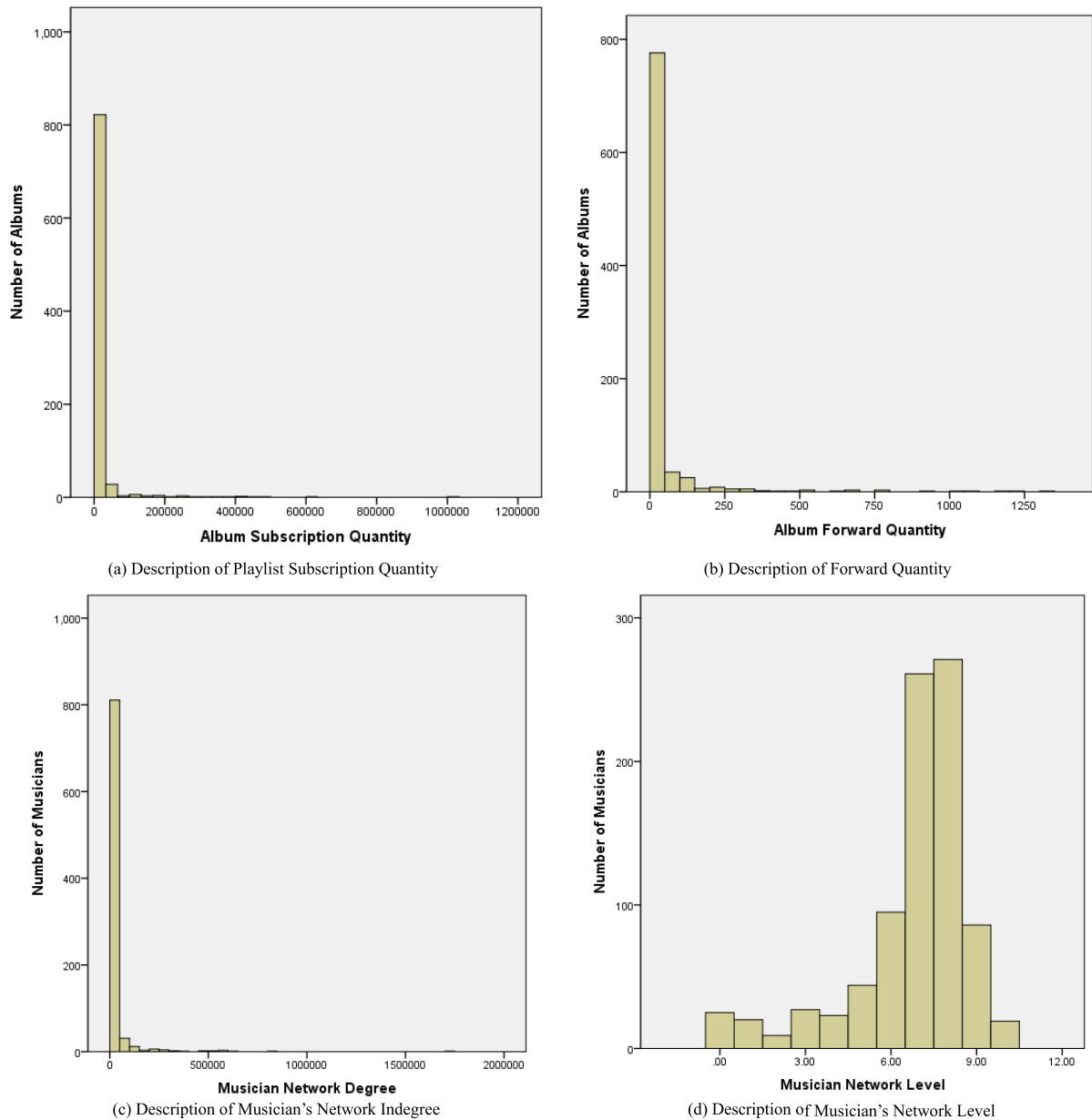(d) Description of Musician's Network Level

FIGURE 3. Characteristics of playlist creators.

had significant negative effects on AFQ. This showed that albums with a moderate number of songs received a higher forward quantity compared to albums with more songs or fewer songs. In M6, the regression coefficient of network degree on forward quantity was 0.463, but the regression coefficient of musician network level (MNL) on AFQ was not significant, indicating that the more fans the musician had in the online community, the higher the album's potential forward quantity.

B. FACTORS INFLUENCING THE DIFFUSION SUSTAINABILITY

Table 5 reports the regression results of original music album characteristics and musician characteristics on album subscription quantity added. From the viewpoint of album characteristics in M7, the days since album creation had no significant effects on the album subscription quantity added (ASA). This showed that the earlier the first song from the album was released, the higher the album's subscription quantity added. In M8, album music quantity squared (AMQ^2) had significant negative effects on ASA. This showed that albums with a moderate number of songs could have a higher subscription quantity added compared to albums with more songs or fewer songs. From the viewpoint of musician characteristics, in M10 the musician network degree had significant positive effects on ASA. This indicated that the more fans the musician had in the online community, the higher the album's subscription quantity added.

TABLE 5. Influencing factors of the diffusion effect.

	M7	M8	M9	M10	M11	M12	M13
ACD	-.007						
AMQ		.256***					
AMQ²		-.232***					
MND			.355***				
MNL			.007				
MDA				.333***			
MMA					.089***		
ASQ						.443***	
AFQ							.392***
F	.038	5.339***	60.689***	105.065***	6.803***	205.705***	153.251***
R²	.000	.013	.126	.111	.008	.196	.154
ΔR²	-.001	.010	.124	.110	.007	.195	.153

TABLE 6. Influencing factors of the diffusion effect.

	M14	M15	M16	M17	M18	M19	M20
ACD	-.007						
AMQ		.261***					
AMQ²		-.238***					
MND			.394***				
MNL			.003				
MDA				.311***			
MMA					.085**		
ASQ						.629***	
AFQ							.613***
F	.042	5.583***	77.583***	90.065***	6.121*	552.698***	508.193***
R²	.000	.013	.156	.097	.007	.396	.376
ΔR²	-.001	.011	.154	.095	.006	.395	.375

Musician network level had no significant effects on the ASA. From the viewpoint of musician network embedding, musician network degree added (MDA) and network movement added (MMA) had significant effects on subscription quantity added. From the viewpoint of album diffusion effect, subscription quantity and forward quantity had significant positive impacts on the ASA, as the higher the diffusion effect of the original music album, the better the album subscription quantity added. Compared with the forward quantity, ASQ had a higher impact on the ASA, as the more original music albums were subscribed to, the higher the subscription quantity added.

Table 6 reports the regression results of original music album characteristics and musician characteristics on album forward quantity added. From the viewpoint of album characteristics, in M14 the days since album creation had no significant effects on AFA. This showed that the earlier the first song from the album was released, the higher the album's forward quantity added. In M15, album music quantity squared (AMQ^2) had significant negative effects on AFA. From the viewpoint of musician characteristics, in M16 the musician network degree had significant positive effects on AFA. This indicated that the more fans the musician had in the online community, the higher the album's forward quantity added. Musician network level had no significant positive effects on ASA. From the viewpoint of musician network embedding, MDA and MMA had significant effects on forward quantity added. From the viewpoint of album diffusion effect, subscription quantity and forward quantity had significant positive impacts on AFA, as the higher the diffusion effect

of the original music album, the better the album forward quantity added.

VI. CONCLUSION AND DISCUSSION

Based on information acceptance theory and social network theory, using original music albums as an example, and implementing two-stage data crawling and quantitative analysis, the present study had several findings. The study examined the relationship between a musician's network characteristics, album characteristics, and the original music album diffusion effect. The findings revealed, through a series of analyses, what kind of original music album is most popular. The present study had several findings. First, album created days had a significant positive effect on album diffusion effect, and musician network degree had a significant positive effect on album diffusion effect. Second, album created days had a significant positive effect on album diffusion sustainability, and musician network degree had a significant positive effect on album diffusion sustainability. Album subscription quantity and album forward quantity had significant positive effects on album diffusion sustainability. Third, album music quantity squared had a significant negative effect on diffusion sustainability and on album diffusion effect. Fourth, musician network embedding had a significant positive effect on diffusion effect and diffusion sustainability.

Contrary to the previous research based on static data, this paper used two-stage data to measure user network embedding and diffusion sustainability. This study, based on the Network embedded perspective, analyzed whether user-created music albums can obtain more subscriptions and forward quantities as the user's network embeddedness increases. Unlike static network centrality, dynamic network centrality reflects the degree of network embedding of users over a time-period. In terms of the impact of Musician Network In-Degree (MND) and Musician Network Movement Added Quantity (MNA) on the album subscription quantity added, it was found that both the network degree and the increase in network degree had a significant impact on the value added of the subscription; the impact degree was relatively close. This result demonstrated that, for users who currently have a low degree of centrality, the sustainability of their album creation can be increased by increasing the degree of centrality.

Diffusion effect in this research was measured by the subscription quantity and forward quantity of original music albums, while diffusion sustainability focuses on the increase in album subscriptions and forwarding. Generally, albums created earlier can obtain more subscriptions and forwards. In order to reduce the impact of creation time in album reach, it is more realistic to conduct research using the added value of two-stage subscriptions and forwards. In the influencing factors analysis of Album Subscription Quantity (ASQ) and Album Subscription Quantity Added (ASA), it was found that Album Created Days (ACD) had a significant effect on ASQ, but ACD had no significant effect on ASA. In the influencing factors analysis of Album Forward Quantity (AFQ)

and Album Forward Quantity Added (AFA), it was found that ACD had a significant effect on ASQ, but ACD had no significant effect on ASA. This result demonstrated that an album created earlier does not necessarily receive more subscriptions or forwards in the future. In addition, Album Music Quantity (AMQ) and Musician Network In-Degree (MND) had more consistent effects on the diffusion effect and diffusion sustainability.

VII. IMPLICATIONS AND LIMITATIONS

This study made some contributions to the existing literature. First, different from previous research on individual network embedding of offline [32] or online networks [33] based on single-stage data, this study used two-stage data to examine the influencing factors of the original music diffusion effect, and revealed the impact mechanism of musician network embedding on diffusion sustainability, from a dynamic perspective. Second, Cao and Sun's [34] research on social media behavior found that information and social overload are significant predictors of exhaustion, which is consistent with this study's findings. We found an inverted u-shaped relationship between album music quantity with diffusion sustainability and the diffusion effect. Such findings also suggested that music overload may lead to exhaustion. Third, Johnson and Ranzini [35] studied music sharing on social networks and found that self-presentational motivations impact media content sharing on social networks. This study further focused on music sharing behavior in the professional music community (NetEase Music). In the study of the factors influencing the diffusion sustainability of UGC, the social network characteristics of musicians were accounted for, which was in accordance with the functional settings of user-generated content applications.

This study has several practical management implications for the development of online communities. For the creator of an original music album, improving personal influence will assist to improve the diffusion sustainability and diffusion effect of their music. In terms of album creation, although the earlier the album is created, the better the diffusion effect will be, the increase of the diffusion effect in the future does not depend on creation time. During the album creation process, the amount of music included in the album should be controlled since albums with too little, or too much, music may not get better diffusion effects. For newly-created albums to be discovered, the online community can set up fair mechanisms to enhance the distribution of recently created albums, particularly those created by musicians with a low network degree. For album creators with a low network degree, future sustainability of album diffusion can be improved through the improvement of network embeddedness, and such musicians should continue to increase their network degree by actively engaging in post movement in the community. Moreover, this study's findings regarding the impact of creator network embedding on album diffusion sustainability validated the social link and information flow mechanism depicted in Figure 1, such as the impact of mutual follows between B

and C on C's subscribe behavior, and the impact of direct links from B to A on B's forward and subscribe behavior.

This study focused on the characteristics and diffusion sustainability of online original music, which includes many themes and styles. Whether there are differences among types of original music, and whether the diffusion sustainability has other important influencing factors, deserves further exploration.

REFERENCES

[1] R.-H. Chen and S.-C. Chang, "Modeling content and membership growth dynamics of user-generated content sharing networks with two case studies," *IEEE Access*, vol. 6, pp. 4779–4796, 2018, doi: 10.1109/ACCESS.2017.2789334.

[2] Y.-W. Chang, P.-Y. Hsu, W.-L. Shiau, and R. Yi, "The effect of customer power on enterprise internal knowledge sharing: An empirical study," *Aslib J. Inf. Manage.*, vol. 67, no. 5, pp. 505–525, Sep. 2015, doi: 10.1108/ajim-02-2015-0028.

[3] Q. Sun, Y. Li, H. Hu, and S. Cheng, "A model for competing information diffusion in social networks," *IEEE Access*, vol. 7, pp. 67916–67922, 2019, doi: 10.1109/ACCESS.2019.2918812.

[4] W. W. Moe and D. A. Schweidel, "Online product opinions: Incidence, evaluation, and evolution," *Marketing Sci.*, vol. 31, no. 3, pp. 372–386, May 2012, doi: 10.1287/mksc.1110.0662.

[5] A. Susarla, J.-H. Oh, and Y. Tan, "Social networks and the diffusion of user-generated content: Evidence from YouTube," *Inf. Syst. Res.*, vol. 23, no. 1, pp. 23–41, Mar. 2012, doi: 10.1287/isre.1100.0339.

[6] S. K. Shriver, H. S. Nair, and R. Hofstetter, "Social ties and user-generated content: Evidence from an online social network," *Manage. Sci.*, vol. 59, no. 6, pp. 1425–1443, Jun. 2013, doi: 10.1287/mnsc.1110.1648.

[7] S. Krishnamurthy and W. Dou, "Note from special issue editors," *J. Interact. Advertising*, vol. 8, no. 2, pp. 1–4, Mar. 2008, doi: 10.1080/15252019.2008.10722137.

[8] X. Wang and Y. Li, "How trust and need satisfaction motivate producing user-generated content," *J. Comput. Inf. Syst.*, vol. 57, no. 1, pp. 49–57, Jan. 2017, doi: 10.1080/08874417.2016.1181493.

[9] J. Zhao, X. Wang, and P. Jin, "Feature selection for event discovery in social media: A comparative study," *Comput. Hum. Behav.*, vol. 51, pp. 903–909, Oct. 2015, doi: 10.1016/j.chb.2014.11.007.

[10] Y. Yang, X. Wang, T. Guan, J. Shen, and L. Yu, "A multi-dimensional image quality prediction model for user-generated images in social networks," *Inf. Sci.*, vol. 281, pp. 601–610, Oct. 2014, doi: 10.1016/j.ins.2014.03.016.

[11] S. M. Mudambi and D. Schuff, "What makes a helpful online review? A study of customer reviews on Amazon.com," *MIS Quart.*, vol. 34, no. 1, pp. 185–200, 2010.

[12] T. Hennig-Thurau, K. P. Gwinner, G. Walsh, and D. D. Gremler, "Electronic word-of-mouth via consumer-opinion platforms: What motivates consumers to articulate themselves on the Internet?" *J. Interact. Marketing*, vol. 18, no. 1, pp. 38–52, Jan. 2004, doi: 10.1002/dir.10073.

[13] C. M. K. Cheung and M. K. O. Lee, "What drives consumers to spread electronic word of mouth in online consumer-opinion platforms," *Decis. Support Syst.*, vol. 53, no. 1, pp. 218–225, Apr. 2012, doi: 10.1016/j.dss.2012.01.015.

[14] J. Luan, Z. Yao, F. Zhao, and H. Liu, "Search product and experience product online reviews: An eye-tracking study on consumers' review search behavior," *Comput. Hum. Behav.*, vol. 65, pp. 420–430, Dec. 2016, doi: 10.1016/j.chb.2016.08.037.

[15] D. M. Greenberg, M. Kosinski, D. J. Stillwell, B. L. Monteiro, D. J. Levitin, and P. J. Rentfrow, "The song is you: Preferences for musical attribute dimensions reflect personality," *Social Psychol. Personality Sci.*, vol. 7, no. 6, pp. 597–605, Aug. 2016, doi: 10.1177/1948550616641473.

[16] A. C. North, "Uses of music in everyday life," *Music Perception, Interdiscipl. J.*, vol. 22, no. 1, pp. 41–77, Sep. 2004, doi: 10.1525/mp.2004.22.1.41.

[17] D. B. Rondeau, "For mobile applications, branding is experience," *Commun. ACM*, vol. 48, no. 7, p. 61, Jul. 2005, doi: 10.1145/1070838.1070867.

[18] E. Priest, "The future of music and film piracy in China," *Berkeley Technol. Law J.*, vol. 21, no. 2, p. 795, 2006.

[19] A. Y. H. Fung, "The emerging (national) popular music culture in China," *Inter-Asia Cultural Stud.*, vol. 8, no. 3, pp. 425–437, Sep. 2007, doi: 10.1080/14649370701393824.

[20] D. Boer, R. Fischer, M. Strack, M. H. Bond, E. Lo, and J. Lam, "How shared preferences in music create bonds between people: Values as the missing link," *Pers. Social Psychol. Bull.*, vol. 37, no. 9, pp. 1159–1171, Sep. 2011, doi: 10.1177/0146167211407521.

[21] S. W. Sussman and W. S. Siegal, "Informational influence in organizations: An integrated approach to knowledge adoption," *Inf. Syst. Res.*, vol. 14, no. 1, pp. 47–65, Mar. 2003.

[22] M. Granovetter, "Economic action and social structure: The problem of embeddedness," *Amer. J. Sociology*, vol. 91, no. 3, pp. 481–510, Nov. 1985, doi: 10.1086/228311.

[23] M. S. Granovetter, "The strength of weak ties," *Amer. J. Sociol.*, vol. 78, no. 6, pp. 1360–1380, 1973.

[24] J. Preece, B. Nonnecke, and D. Andrews, "The top five reasons for lurking: Improving community experiences for everyone," *Comput. Hum. Behav.*, vol. 20, no. 2, pp. 201–223, Mar. 2004, doi: 10.1016/j.chb.2003.10.015.

[25] A. Bhattacherjee, "Understanding information systems continuance: An expectation-confirmation model," *MIS Quart.*, vol. 25, no. 3, p. 351, Sep. 2001, doi: 10.2307/3250921.

[26] C. M. K. Cheung and D. R. Thadani, "The impact of electronic word-of-mouth communication: A literature analysis and integrative model," *Decis. Support Syst.*, vol. 54, no. 1, pp. 461–470, Dec. 2012, doi: 10.1016/j.dss.2012.06.008.

[27] E.-J. Lee and S. Y. Shin, "When do consumers buy online product reviews? Effects of review quality, product type, and reviewer's photo," *Comput. Hum. Behav.*, vol. 31, pp. 356–366, Feb. 2014, doi: 10.1016/j.chb.2013.10.050.

[28] A. G. Schick, L. A. Gordon, and S. Haka, "Information overload: A temporal approach," *Accounting, Org. Soc.*, vol. 15, no. 3, pp. 199–220, 1990, doi: 10.1016/0361-3682(90)90005-F.

[29] W. Li, L. Tian, X. Gao, and B. Pan, "Impacts of information diffusion on green behavior spreading in multiplex networks," *J. Cleaner Prod.*, vol. 222, pp. 488–498, Jun. 2019, doi: 10.1016/j.jclepro.2019.03.067.

[30] C. Forman, A. Ghose, and B. Wiesenfeld, "Examining the relationship between reviews and sales: The role of reviewer identity disclosure in electronic markets," *Inf. Syst. Res.*, vol. 19, no. 3, pp. 291–313, Sep. 2008, doi: 10.1287/isre.1080.0193.

[31] P. Shao and H. Chen, "Driving factors for opinion diffusion behavior in consumers on online social networks: A study of network characteristics," *IEEE Access*, vol. 7, pp. 118509–118518, 2019, doi: 10.1109/ACCESS.2019.2932571.

[32] P. W. Hom and Z. Xiao, "Embedding social networks: How guanxi ties reinforce Chinese employees' retention," *Org. Behav. Hum. Decis. Processes*, vol. 116, no. 2, pp. 188–202, Nov. 2011, doi: 10.1016/j.obhdp.2011.06.001.

[33] H. Li, Z. Zhang, F. Meng, and R. Janakiraman, "Is peer evaluation of consumer online reviews socially embedded?—An examination combining reviewer's social network and social identity," *Int. J. Hospitality Manage.*, vol. 67, pp. 143–153, Oct. 2017, doi: 10.1016/j.ijhm.2017.08.003.

[34] X. Cao and J. Sun, "Exploring the effect of overload on the discontinuous intention of social media users: An S-O-R perspective," *Comput. Hum. Behav.*, vol. 81, pp. 10–18, Apr. 2018, doi: 10.1016/j.chb.2017.11.035.

[35] B. K. Johnson and G. Ranzini, "Click here to look clever: Self-presentation via selective sharing of music and film on social media," *Comput. Hum. Behav.*, vol. 82, pp. 148–158, May 2018, doi: 10.1016/j.chb.2018.01.008.

GENQIANG LI was born in Changge, Henan, China, in 1977. He is currently pursuing the Ph.D. degree with the School of Management, Xi'an Jiaotong University. He is also an Associate Professor with the School of Psychology, Xinxiang Medical College. He received the support from the Ministry of Education, Humanities and Social Sciences Foundation of China. His current research interests include user behavior and social networks.

RENJING LIU was born in Wulumuqi, China, in 1966. He received the Ph.D. degree in management science and engineering from Xi'an Jiaotong University, China, in 1999. He is currently a Professor with the School of Management, Xi'an Jiaotong University. He received the support from the National Natural Science Foundation of China and the National Social Science Fund. He has published several important articles in international journals, such as *Journal of Artificial Societies and Social Simulation*, *European Journal of Operational Research*, and *Complexity*. His current research interests include information management and social networks.

• • •