Evaluation of Charm Factors of Short Video User Experience using FAHP – A Case Study of Tik Tok APP

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Abstract: By reviewing literature on short video apps and interviewing experts, this study determined three major aspects of Tik Tok user experience, emotionality, interactivity and usability, and identified nine key factors to construct the hierarchical structure of analytic hierarchy process (AHP). Based on questionnaires from experts, the Analytic Hierarchy Process (AHP) was used to determine each dimension and factor weight. Considering the defects of AHP, we introduced the fuzzy theory and fuzzy analytic hierarchy process (FAHP) to solve related problems. Finally, through the FAHP software developed by MATLAB 2015a GUI, the fuzzy weight of charm factors involved in the Tik Tok user experience is concluded as follows: emotional factors account for 48.77%, interactive factors for 31.23%, and usability factors for 20.00%. This study provides certain reference for design and update of short video apps.

1. Introduction

The report CNNIC: The 40th Statistical Report on The Development of The Internet in China in 2017 showed that with the continuous development of Internet, the size of China's Internet users had reached 751 million as of June 2017 and there were a total of 19.92 million new users in just half a year, marking a growth rate of 2.7%. It also revealed that the number of mobile Internet users in China had reached 724 million by June 2017, an increase of 28.3 million from the end of 2016. Internet users have access to TV, newspapers, books, periodicals and mobile Internet media, such as blog, WeChat, Toutiao, Tik Tok and other new media. Tik Tok is also developing rapidly in South Korea, Japan, Taiwan and other places, forming a phenomenon of "shake" at home and abroad [1]. Tik Tok APP has certain advantages in product positioning and product uniqueness [2]. In terms of product positioning, its target group is mainly young people. In terms of product features, the interface design is divided into two parts: recommendation and attention. It is simple and easy to use, attracting more target users [3]. Mobile short video apps are popular among users for easy shooting, simple editing, convenient sharing and low requirements for professional skills. The scale of Internet users continues to increase, providing a solid audience base for the rise and development of mobile short video apps.

Short video apps are a new form of media that has not been defined in academic term yet. According to iiMedia Research, a short video app is a new type of social software featuring easy shooting, playing, editing and sharing based on mobile intelligent terminals. Compared with traditional video APPs, videos from short video APP tend to be shorter, thus better filling users' fragmented time. In addition, it also
features low production threshold, strong editing functions, convenient sharing, intelligent platform and easy accessibility.

According to Jiguang, a big-data firm, statistics in March 2018 showed that the monthly active users (MAU) of Tik Tok (between February 2017 and February 2018) exceeded 32 million, with a rate of market dominance of 14.34%, indicating that among the Internet users in China, fourteen out of every 100 terminal devices were installed with Tik Tok, an increase of over 300% compared with the initial period. During this time period, the number of daily users was 977,900, and the seven-day installation retention rate averaged 73.38% in half a year, proving that 70% of users were willing to keep the app after using it. According to the Jiguang's user monitoring, young users accounted for a large proportion, with 20% under the age of 19 and 52.8% under 24. From the geographical distribution, it is found that the first-tier cities account for 8.22% of all Tik Tok users in China, the second-tier cities 34.39%, the third-tier cities 21.51%, and the fourth-tier cities below 35.87%, indicating that there is no obvious centralized trend in the distribution of cities, and the acceptability of each city is relatively balanced. Despite the lower proportion in first-tier cities, their daily growth rate is more prominent. Chinese mobile device users spend more than 4.2 hours a day on their phones, including 20.27 minutes on Tik Tok. Tik Tok users have a high degree of coincidence with other short-video app users, with 43.13% of Tik Tok users installing Kuaishou APP on their phones, 15% of users having Huoshan APP, and 13% with Meipai at the same time. Therefore, Kuaishou APP is still a strong competitor against Tik Tok in the future.

2. Research method

Fuzzy analytic hierarchy process (FAHP) quantifies the abstract relations between various factors through pairwise comparison, and guarantees the validity of questionnaires through consistency verification, so as to control the reliability of the results. However, AHP is susceptible to extreme values. The establishment of hierarchy relationship is too subjective, and the respondents might lack an overall understanding of the problems of the whole hierarchy. Therefore, scholars introduced the concept of Fuzzy Theory and Fuzzy Analytic Hierarchy Process (hereinafter referred to as FAHP) to solve the above problems. The fuzzy weight of decision criteria is obtained by integrating the individual opinions of testers [4].

Steps involved in FAHP:

1. AHP implementation: experts are entrusted to conduct pairwise comparison against evaluation criteria, and input the explicit value of pairwise comparison of the two criteria, and then calculate the eigenvector and eigenvalue to obtain relative weight of each level of elements.

2. At the same time, consistency verification must be carried out for the "explicitly" paired comparison values given by experts, and the consistency Index (C.I.) < 0.1 is adopted as the standard to obtain the weight distribution of each expert's criterion before being converted into triangular fuzzy number so as to reduce inconsistency caused by direct fuzzy number setting[5].

3. Establishment of fuzzy trigonometric function of weights based on expert criteria: the weights obtained in the previous stage based on various expert criteria may not be equal, and the calculation of the weights by the average value may cause loss of information. Therefore, the fuzzy weight of each criterion is obtained by fuzzy trigonometric function, which is based on the weight from all experts' criteria and the following principles, as shown in Figure 1.

![Figure 1 Fuzzy trigonometric function](image-url)
(4) The fuzzy weight attribution function by experts is not definite value and cannot serve as a reference to compare the importance of each criterion. Defuzzification is then carried out under the gravity rule to produce the fuzzy number as the final weight.

\[
\tilde{N} = \left( L_A, M_A, U_A \right)
\]

\[ L_A = \min(x_{Ai}), i = 1, 2, 3, ..., n \]  \hspace{1cm} (1)

\[ M_A = \left( X_{A1} \times X_{A2} \times \cdots \times X_{An} \right)^{1/n} \]  \hspace{1cm} (2)

\[ U_A = \max(x_{Ai}), i = 1, 2, 3, ..., n \]  \hspace{1cm} (3)

where A is the criterion code, \( i \) the code for decision maker, \( \tilde{N} \) the fuzzy attribution function of criterion importance, \( X_{Ai} \) the \( i \)th decision maker's evaluation value of criterion A, \( L_A \) the lower limit of decision group's evaluation of criterion A, \( M_A \) the geometric average of decision group's evaluation of criterion A, and \( U_A \) the upper limit of decision group's evaluation of criterion A[4].

3. The Empirical Analysis

3.1. Hierarchical structure

Three senior experts in Tik Tok-related design (with more than five years of short video design experience) and four art and media design teachers (with more than five years of teaching experiences) were invited to conduct focus group discussions. Through discussion from the perspective of experience, four dimensions were designed including emotion, thinking, interaction and operation. Feng Yuliang, Chen Junzhi, Wu Shuming adopted the evaluation construction method as the basis of the questionnaires and obtained quantitative data through questionnaire survey to study of Tik Tok users' experience[6]. Finally, using the statistical linear regression analysis in the statistical software, it is concluded that the charm of Tik Tok users' experience mainly involve three experience attributes: emotion, interaction and usability. The significant factors include "acquisition of knowledge and broadened vision" and "attractive music dubbing". In terms of interaction, "imitation performance" and "mind relaxing" are the significant factors. As to usability, "easy to switch between videos" is the significance factor. Factors such as "funny stories", "share and like", "powerful special effects editing" and "easy to learn", though not significant in statistics, have been considered as important indicators. For this reason, they are included in the hierarchical structure (see Figure 2).

![Figure 2 Hierarchical Structure](image_url)
3.2. Statistical Analysis of AHP and FAHP

The research tool is a FAHP software based on MATLAB 2015a GUI. It integrates and analyzes the data from AHP expert questionnaire, and obtains the weight values of AHP and FAHP between factors through correlation calculation (see Figure 3, 4, 5 and 6).

According to the AHP statistics, the consistency Index (C.I.) of Tik Tok APP's user experience is 0.052<0.1, in line with the consistency test. In Tik Tok APP users' experience, emotional factors account for 49.34%, interactive factors for 31.08% and usability for 19.58%. Emotional C.I. was 0.051, interactivity C.I. was 0.051, and usability was 0.00, all less than 0.1, consistent with the consistency test. From the importance analysis, it is concluded that emotional > interactive > usability.

"Music dubbing" accounted for 26.98% of the total weight in nine factors, "funny story" accounted for 17.00%, "mind relaxing" 16.41%, "easy to switch between videos" 10.57%, "imitation performance" 10.34%, "easy to learn" 5.81%, "broadened vision" 5.35%, "share and like" 4.34%, and "powerful effects editing" 3.2%. Influencing factors weighing more than 10% include: music dubbing> funny stories> mind relaxing> easy to switch between videos > imitation performance.

According to FAHP statistics, emotional factors account for 48.87%, interactive factors 31.23% and usability for 20.00% of Tik Tok user experience. The importance analysis reveals emotional > interactive > usability.

"Music dubbing" accounted for 25.08% of the total weight in nine factors, and "funny story" accounted for 18.20%, "mind relaxing" 15.46%, "imitation performance" 11.31%, "easy to switch between videos" 10.75%, "easy to learn" 5.85%, "broadened vision" 5.49%, "share and like" 4.46%, and "powerful effects editing" 3.40%. Influencing factors weighing more than 10% include: music dubbing> funny stories> mind relaxing> imitation performance> easy to switch between videos.

3.3. Case Validation

Among the top 10 most popular Tik Tok accounts in August 2019. Three accounts which won more than 300 million likes were all related to funny stories, music and imitation (see Figure 7). As of August 2019, "Talking Liu", a pair of talking cats, won over 410 million likes for their funny dubbing. "Chen Xiang 6:30", a short video featuring funny stories, has been liked more than 330 million times. "Guo Congming", integrating funny music with imitation performance in creative techniques, have been liked more than 320 million times. The results obtained from the above works indicate that Tik Tok users' experience is largely influenced by factors such as emotion and interaction, which is verified by the actual works that are popular among users. In the specific factors, music dubbing, funny stories and imitation performances have also been verified in the above three accounts, indicating their influences on users.
4. Conclusions
This study determined the hierarchical structure of Tik Tok user experience by literature review and expert interviews. Based on questionnaires from experts, the Analytic Hierarchy Process (AHP) was used to determine AHP and FAHP weight distribution. The comparison between AHP and FAHP shows that the weight distribution of three dimensions is the same: emotional factors > interactive factors > usability factors. The weight difference between AHP and FAHP is not significant. Among the nine specific factors in AHP and FAHP, factors weighing over 10% include: music dubbing, funny stories, mind relaxing, easy switch between videos, and imitation performance. Emotional and interactive dimensions account for 80% of the weight, indicating their significance. Therefore, in later design or update of the Tik Tok app, more researches should be carried out in the aspects of emotion and interaction. In terms of nine specific factors, five factors weighing more than 10% totaled over 80%, including music dubbing, funny stories, mind relaxing. These factors and other aspects of design could be enhanced in future researches.

Acknowledgement
Foundation project: Key Projects of Humanities and Social Sciences in Universities in Anhui Province in 2017: Application of Virtual Reality (VR) Technology in the Digital Restoration and Display of Huizhou Sculpture – a Case Study of Huizhou Stone Carving (SK2017A0370); 2018 youth foundation project by Education Ministry Humanities and Social Science: Image Study of Traditional Chinese Architecture – Taking Anhui Style Architecture as An Example (18YJC760072);

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