

Factors fluence the success of mobile games in China

Tianyu Gao

Collage of Liber Arts, Wenzhou-Kean University, Wenzhou, China

*Corresponding author: gaoti@kean.edu

Abstract. This study analysis factors that affect the success of mobile games in China. Top 200 mobile game data of the 365 days download ranking in China from June 6, 2021, to June 4, 2022, as the representative of successful mobile games in China. To explore the relationship of factors with mobile games performance, correlation analysis, chi-square goodness-of-fit, and independent two samples t-test are used to perform data analysis. The results showed there is no relationship and difference between the usage of IP and mobile game performance. However, there is a weak positive relationship between the usage of advertisement and mobile game performance. Results also revealed that simulation games, action games and hypercausal games account for a high proportion on the successful game, while there is almost no manager, idle, and music games in the successful game. From the perspective of mobile game industry, this study provides a valuable insight on the production and promotion of mobile game.

Keywords: Mobile game, Correlation Analysis, t-test.

1. Introduction

In recent years, the global mobile game market has developed rapidly. Jeong and Kim predicted that mobile games would become one of the leading platforms in the world game market within 10 years [1]. As a "new" media industry, the revenue of the mobile electronic game industry in the Asia Pacific market has exceeded that of the traditional media markets in Europe and the United States. According to Sensor Tower, the top 30 mobile game publishers in China accounted for about 29% of the global mobile game revenue in 2020, which shows the success of Chinese mobile games to some extent. As the mobile game market grows, many developers enter the market and produce a huge number of mobile games. It is worth investigating the factors behind successful games to offer valuable suggestions for the game industry [2]. Many studies start with specific games and use case studies to explore the success factors of mobile games [3-5]. However, there are very few empirical studies using mobile game market data for analysis until now. This study takes the mobile game downloads as a performance indicator to analyze what factors cause the success of mobile games. The study proposes a set of factors that affect the success of mobile games and empirically tests whether they do have a significant relationship or influence on the performance of mobile.

According to Statista, in the past decade, China's game revenue has increased more than sixfold, and exceeded the 296-billion-yuan mark in 2021[6]. In terms of game revenue, mobile games ranked first, accounting for more than 76% of the market share in 2021. In terms of game users, the number of game users in China reached 666 million in 2021. Therefore, it is worthwhile to study what factors affect the prosperity of mobile games performance in the Chinese market.

2. Literature Review and conceptual framework

2.1 Mobile game and market

The definition of mobile game is usually focus on the technology perspective, which generally means games on the mobile phone or mobile device [7]. However, the laptop computers are not considered as mobile device when referring to mobile games [8]. Therefore, based on those research, mobile game can be concluded that the games on the mobile phone or tablets. With the development of mobile content industry, mobile games supported by mobile features such as mobility, generality and simplicity have shown the highest growth rate in the world game market [1]. These advantages

of mobile games cannot be achieved by PC games. Because of the development of mobile technology in recent years, the market growth of mobile games has even exceeded that of traditional media [9]. IOS and Android are the most commonly used platforms worldwide [10]. China currently only uses these two platforms, so the data of Chinese mobile games should come from these two platforms.

2.2 IP

In the global market, China is investing more and more excellent IP in various countries, such as Disney, Marvel, and Sony, trying to obtain the license to use IP through investment or cooperation [11]. In mobile games, IP means to borrow the reputation of popular brands such as *Marvel* or *Harry Potter* to create games, or to remake the original PC/ host games into mobile versions [2]. IP includes not only licensing successful content from other companies but also mining IP from their own content. In Asian culture, especially in Japan, the use of IP or cooperation with popular animation may be an important factor to promote the realization of real-time applications [12]. In addition, many game companies in China have also developed their own unique IP matrix, such as NetEase's *Onmyoji* division series and miHoYo's *Honkai* series. NetEase continues to develop based on existing successful games to offer multi-dimensional content by leveraging in-house developed franchises and intellectual property [13]. For instance, *Onmyoji*, one of NetEase's in-house franchises, has expanded three mobile games in MOBA, card, and simulation genres. The user's choice of mobile games may be affected by the using of IP.

2.3 Genre of Games

Mobile game content developers can also focus on women, a consumer segment in the game industry that is still often overlooked [14]. In recent years, there have been many games with women as the main target group, such as China's Paper company, which specializes in creating love and dressing games for women [4]. Japan's female game industry is also very prosperous. According to an EFA analysis of Li based on Steam platform, 29 factors were extracted to classify game types based on more than 20000 video game data and 77 game tags [15]. His investigation shows that the games on Steam are basically a combination of these 29 factors. Although Li's research is based on PC video games, the biggest difference between mobile games and PC games is portability, which has no significant impact on game types. Therefore, the genre of mobile game is similar to the game type factors extracted by Peever, Johnson, and Gardner claimed that people with different personalities would have different game genre preference, and Lee, et al.'s research shows that teenager in South Korean shows different addiction score to different types of games[16,17]. Thus, game genre could have an impact on the success of game.

2.4 Advertisement

Compared with PC games, mobile games have a relatively short life cycle. Early satisfaction of the game is another important factor that determines the initial growth of the game. The first version of the game must have attractive elements to meet the early adopters [2]. Therefore, the publicity before the release of the international version of mobile games is crucial to the success of mobile games. Social media can provide interactive opportunities for marketers to promote consumer participation and build sustainable relationships [18]. Yi, Li, & Kim also mentioned that the continuous updating of game video is also one of the factors for the success of the game in recent years, many mobile games have created official accounts on social media platforms to release CG and promote game activities in advance [2]. The traditional role of game mechanism manufacturers and distributors or retailers has been weakened, and the social media provides a new communication and intermediary platform for game developers and consumers [19]. Therefore, whether a mobile game has an official promotion account on social media is an important indicator to measure mobile game advertising.

3. Methodology

3.1 Data collection

The data of this study will mainly be collected from data.ai, google, Sina Weibo, TikTok, and bilibili.

data. ai, called app Annie before its name was changed, and its data is often used to study the game market. According to data. ai's official website, more than 90% of the top 100 application publishers choose to use data ai's products and services, with more than 6 million applications using data. ai's analytics tool tracks downloads, revenue, rankings, and reviews. data. ai tracks more than 60 billion downloads and \$17 billion in App Store revenue. Therefore, data.ai is a reliable source of mobile game data. Google is used to search whether the production of mobile games uses the existing IP, such as *Marvel* or *Harry Potter*, or whether it carries out in-game activities with other IP, such as the linkage activities of *Onmyoji* and *Demon Slayer*. Sina Weibo, TikTok, and bilibili are used to find out whether mobile games have established official accounts on them to update game videos and activity information. Since this research mainly focuses on the Chinese market, these three social media are representative and universal.

As for performance measurement of mobile game, this study collected the top 200 mobile game data of the 365 days download ranking in China from June 6, 2021, to June 4, 2022, as the representative of successful mobile games in China. The number of downloads is related to the popularity of the game and is the basis for generating revenue [2]. The study only uses downloads as the measurement. However, considering that some games have reached the highest downloads at the initial stage of the launch, this study adds cumulative downloads as another indicator [20]. This provides sufficient validity for the research.

3.2 Conceptual framework, operational definition & hypothesis

3.2.1 Conceptual framework

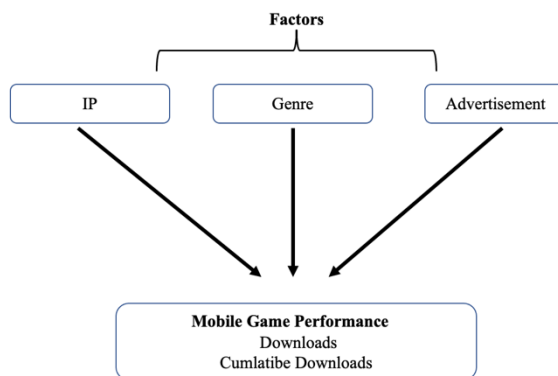


Fig. 1 Conceptual framework of factors influencing mobile game performance

3.2.2 Operational definitions and type

Downloads: continuous variable

Sum of downloads over the selected time period (Jun 6, 2021 - Jun 4, 2022)

Cumulative Downloads: continuous variable

All time downloads up from the game release into market until the last selected date (June 4, 2022).

Genre: nominal variable

Genre of game (RPG, action, shooting, strategy, match, casino, simulation, hypercasual, racing, runner, other, manager, idle, music, puzzle, tabletop, sports, party)

IP: ordinal variable

Whether the game use pervious IP or correlated with other IP in game activity over the selected period (Jun 6, 2021 - Jun 4, 2022) i (0 = No, 1 = Yes)

Advertisement: *ordinal variable*

Whether the game creates an official account on the Chinese social media (Sino Weibo, TikTok, Bili Bili) to update game video or information over the selected period (Jun 6, 2021 - Jun 4, 2022) *i* (0 = No, 1 = Yes)

3.2.3 Hypothesis

H₁: There is a relationship between the usage of IP and mobile game performance.

H₂: There is a relationship between advertisement and mobile game performance.

H₃: All genres are chosen with equal probability.

H₄: There is a difference between the usage of IP and mobile game performance.

H₅: There is a difference between the usage of advertisement and mobile game performance.

As the dependent variables, the downloads and cumulative downloads of each mobile game are used to measure the performance of the game. Game types include RPG, action, shooting, strategy, match, casino, simulation, hypercasual, racing, runner, manager, idle, music, puzzle, tabletop, sports, party, and other. IP is an independent variable that indicates whether the game is made based on the existing IP, or whether the existing PC/ host game is transformed into a mobile game or linked with other IP within the selected time period. Advertisement variable indicates whether mobile games create official accounts and update game videos on Chinese social media platforms (Sina Weibo, TikTok, and bilibili). Dichotomous scale is a scale that provides two options on opposite ends, such as Yes/No or Agree/Disagree. This study will use the dichotomous scale to measure variables IP and Advertisement, and Yes is represented by 1 while No is represented by 0 [21].

3.3 Data Analysis

The study will use Jamovi, a statistical software for the social science as a data analysis tool [22].

This study will explore the relationship of factors with mobile games performance through correlation analysis and independent two samples t-test. Specifically, the correlation analysis matrix is used to determine the relationship between different variables and mobile game performance. Independent t-test is used to detect whether there is a significant difference between the number of game downloads whether using IP and advertisement variables. However, through the assumption check of the data collected, a Shapiro-wilk test was performed (Table 1) and showed that the distribution of downloads and cumulative downloads departed significantly from normality ($W=.50$, $p<.001$; $W=.53$, $p<.001$). Therefore, a non-parametric test Mann-Whitney U test was employed to compare the means of whether use IP or advertisement.

Table 1. Normality check of the dependent variables

Normality Test (Shapiro-Wilk)		
	W	p
Downloads	0.50694	< .001
Cumulative Downloads	0.53786	< .001

Note. A low p-value suggests a violation of the assumption of normality

Table 2. Descriptive statistic collected data

Descriptives	Downloads	Cumulative Downloads	IP	Advertisement	Genre
N	200	200	200	200	200
Missing	0	0	0	0	0
Mean	3.0194	15.944	0.10000	0.57000	
Median	1.8900	4.9850	0.0000	1.0000	
Standard deviation	3.7857	31.095	0.30075	0.49632	
Minimum	1.1700	1.1700	0	0	
Maximum	37.500	279.00	1	1	
Shapiro-Wilk W	0.44362	0.47138	0.34206	0.62927	
Shapiro-Wilk p	< .001	< .001	< .001	< .001	

A Chi-square goodness-of-fit test is be used to determine whether the numbers in each category as we expected for nominal scale data [23]. The type of variable genre is nominal, so this study will use Chi-square goodness-of-fit test to examine the distribution of the genre in our data set with the theoretical distribution. A p-value <.05 will indicate statistical significance.

4. Result & Discussion

4.1 Correlation analysis

The results of correlation analyses show in the table 2. The variable IP and downloads were found to be negligible positive correlated, $r(198) = .037$, $p < .594$. The variable advertisement and downloads were found to be weak positive correlated, $r(198) = .22$, $p < .05$. The variable advertisement and cumulative downloads were also found to be weak correlated, $r(198) = .19$, $p < .05$. In general, there is no relationship between mobile game performance and IP, and a weak positive relationship between mobile game performance and advertisement.

Table 3. Correlation Matrix variables

Correlation Matrix

		Downloads	Cumulative Downloads	IP	Advertisement
Downloads	Pearson's r	—			
	p-value	—			
Cumulative Downloads	Pearson's r	0.82103	***	—	
	p-value	< .001	—		
IP	Pearson's r	0.03792	0.03499	—	
	p-value	0.594	0.623	—	
Advertisement	Pearson's r	0.22013	**	0.19952	**
	p-value	0.002	0.005	0.002	—

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

4.2 The χ^2 (chi-square) goodness-of-fit test

Table 3 shows the proportion of each genre of game and the test result of chi-square test. The Chi-square goodness-of-fit test showed that the distribution of the genre (table 3) was violate with the theoretical distribution ($\chi^2 = 208.60$; $df = 17$; $p < 0.01$). Therefore, it can be concluded that the proportion of genre is significantly different. From the table we could see that genre with the highest proportion (0.195) is simulation, and runner, manager, Idle, and music are with the lowest proportion (0.005). In addition, genre RPG, action and hypercasual shows a relative high proportion among all genres.

Table 4. Proportions of genre

Proportions - Genre

Level	Count	Proportion
RPG	25	0.1250000
Action	24	0.1200000
Shooting	5	0.0250000
Strategy	17	0.0850000
Match	11	0.0550000
Casino	11	0.0550000
Simulation	39	0.1950000
Hypercasual	32	0.1600000
Racing	5	0.0250000
Runner	1	0.0050000
Other	3	0.0150000
Manager	1	0.0050000
Idle	1	0.0050000
Music	1	0.0050000
Puzzle	12	0.0600000
Tabletop	4	0.0200000
Sports	6	0.0300000
Party	2	0.0100000

Table 5. χ^2 (chi-square) goodness-of-fit test of genre

χ^2 Goodness of Fit		
χ^2	df	p
208.60	17	< .001

4.3 Two sample Mann-Whitney U test

4.3.1 IP

Table 4 shows descriptive statistic of variable IP. The test result of two sample Mann-Whitney U test is in table 5, there was no significant effect for IP, $t(199) = 1616$, $p = .46$, despite using IP ($M = 3.45$, $SD = 5.30$) getting higher downloads that not using IP ($M = 2.97$, $SD = 3.60$). In addition, there was also no significant effect for IP, $t(199) = 1780$, $p = .937$, despite using IP ($M = 19.20$, $SD = 41.07$) getting higher cumulative downloads that not using IP ($M = 15.58$, $SD = 29.90$).

Table 6. Descriptive statistic

Descriptives			
	IP	Downloads	Cumulative Downloads
N	0	180	180
	1	20	20
Mean	0	2.9717	15.582
	1	3.4490	19.199
Standard deviation	0	3.5953	29.909
	1	5.3021	41.072

Table 7. Mann-Whitney U test of IP

Independent Samples T-Test			
		Statistic	p
Downloads	Mann-Whitney U	1616.0	0.455
Cumulative Downloads	Mann-Whitney U	1780.0	0.937

4.3.2 Advertisement

Table 6 shows descriptive statistic of variable advertisement. The test result of two sample Mann-Whitney U test is in table 7, the 114 mobile games who has advertisement ($M = 3.74$, $SD = 4.81$) compared to the 86 mobile games who did not have advertisement ($M = 2.06$, $SD = 1.11$) demonstrated significantly better downloads, $t(199) = 3342.0$, $p < .001$. Moreover, the 114 mobile games who has advertisement ($M = 21.32$, $SD = 38.93$) compared to the 86 mobile games who did not have advertisement ($M = 8.82$, $SD = 12.62$) demonstrated significantly better cumulative downloads, $t(199) = 4018.0$, $p = .029$.

Table 8. Descriptive statistic

Descriptives			
	Advertisement	Downloads	Cumulative Downloads
N	0	86	86
	1	114	114
Mean	0	2.0623	8.8185
	1	3.7414	21.319
Standard deviation	0	1.1107	12.620
	1	4.8050	38.925

Table 9. Mann-Whitney U test of advertisement
Independent Samples T-Test

		Statistic	p
Downloads	Mann-Whitney U	3342.0	< .001
Cumulative Downloads	Mann-Whitney U	4018.0	0.029

5. Conclusion

In the past decade, China's game market share has grown rapidly. Mobile game revenue has occupied the leading position in China's game industry. Many game publishers have produced a large number of games in order to seize market share. Therefore, exploring the success factors of mobile games can provide constructive insights for the mobile game industry. This study captured and analyzed the data of the top 200 mobile games downloaded in China from Jun 6, 2021, to Jun 4, 2022, aiming to find out the reasons for the popularity of these games. The life cycle of mobile games is very short, the newly launched games will get a huge number of downloads, so this study also uses the cumulative downloads (from the release day of the game to the last day of the selected time period) as the dependent variable. Through establishing correlation analysis matrix, chi-square goodness-of-fit test and independent t-test, the relationship between dependent variable downloads and cumulative downloads and different independent variables was explored.

Based on the research findings, there is no significant correlation between the downloads or the cumulative downloads and usage of IP. In addition, there is no significant difference between the usage of IP and downloads. However, both downloads and the cumulative downloads have a weak positive correlation with the use of advertisement, and the usage of advertising or not will make a significant difference in downloads between games. In terms of game genre, among the popular mobile games in China, simulation games, action games and hypercasual games account for a high proportion, while there is almost no manager, idle, and music games.

From the research findings, whether to use the existing IP in mobile games has no significant impact on the performance of the game. The use of in-house IP may cause the transformation of same players among the game with the same IP, thus, it can not play a good role in expanding users. As for IP using popular brands or works, it may involve a huge consumption of funds, thus reducing the budget for the production of the game itself and reducing the quality of the game. Therefore, whether to use IP in mobile games is a point that mobile phone manufacturers need to consider carefully. In terms of advertising, this study found that operating official game accounts on social media to update game information and video has a significant impact on game performance. Based on this finding, game manufacturers can invest more sources and money in operating social media accounts. The good interaction between the official account and the players may further promote the formation of the game community and increase the loyalty of users.

This study has some limitations. For example, the way to measure the performance of mobile games only uses the download volume, and the game revenue has not been measured. On the one hand, some of the top 200 games in the rankings come from overseas countries, and their revenue data cannot be obtained. On the other hand, there are also some games on the ranking list from small Chinese studios, and the revenue has not been publicized. In terms of measuring advertising, this study only focuses on the operation of the official account of social media and does not pay attention to other impacts such as TV advertising and app store advertising. In addition, this study does not involve the impact of national policies on the success of games. For example, China's recent policy of restricting minors' playing time may lead to a decline in the performance of some popular games. In general, although this study has limitations, it could play a potential reference role for future research in the mobile game industry.

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