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From traditional gaming to mobile gaming: Video game players' switching behaviour

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ABSTRACT

This paper intends to uncover whether mobile gaming is complemental or substitutable to traditional gaming. A human migration framework, the Push-Pull-Mooring, is adopted to the context of video game switching. A total of 340 valid samples were collected from Chinese video game forums. We applied K-mean clustering to find different video game player segments. We also applied Ordinary Least Squares (OLS) to estimate linear regression models for the whole sample and the identified segments. Results demonstrate that 7 of the 13 variables included in the conceptual model have a significant impact on the switching intention, which are Perceived expensiveness of traditional gaming(PE), Perceived flexibility of mobile gaming(PF), Perceived cost of lost benefits(PCLB), Perceived high performance of traditional gaming(PGP), Past traditional gaming experience(EXPT), Past mobile gaming experience(EXPM), and Ownership of hybrid consoles(OHC). Moreover, results from the clustering analysis show that there are two segments in our sample, labelled Unshakable stayer and Moderate intentional emigrant. Switching intention from traditional to mobile gaming is low across the whole sample, although there are differences between the segments. We conclude that traditional gaming is not being substituted by mobile gaming. In turn, mobile gaming serves a complementary role for the players of traditional gaming.

1. Introduction

On February 27, 1996, a legend of video game history landed on the Japanese video game industry. Its name was Pokémon Red version/Blue version, a role-play video game developed by Game Freak and published by Nintendo for Game Boy. By 1997, Pokémon had sold 10.4 million copies in Japan [1] and its influence spread like wildfire beyond Asia, to make record sales of 9.85 million US dollars in the United States [2]. Twenty years later, the successor to the original Pokémon, Pokémon Go, set the world on fire anew. According to Newzoo [3], Pokémon Go accrued 470 million US dollars in revenues and 550 million installs within 80 days of its launch, thus catapulting itself into the Pantheon of video games.

The changes of gaming forms of Pokémon series (from traditional gaming to mobile gaming) is a good example of the development of video games. Today, the global video games market is mainly driven by mobile games, and the reasons for this development can be found in the general shift to mobile devices [4]. In recent years, game makers and players' interest have moved from traditional gaming (i.e. Video game consoles including portable consoles, and PC) to mobile gaming (i.e. smartphones and tablets)[1]. The revenue share of mobile gaming has grown steadily since 2012 [5]. By 2018, mobile games were, for the first time, the largest subgroup in the global video game industry [6]. Meanwhile, the revenue share from traditional gaming has shrunk from 63% [7] to 49% [6]. In the future, mobile gaming will produce revenues of $95.4 billion in 2022, growing with a compound annual growth rate of + 11.3% to account for almost half (49%) of the entire games market [8].

Thus, from the previous industrial data, we have observed a gradually shrinking traditional gaming market and a gradually growing mobile gaming market. Nevertheless, if we focus our attention on a more micro level, we could speculate that the observed switching tendency of revenue from traditional gaming to mobile gaming in the industry would be due to the players' switching behaviour at the individual level.

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[1] We acknowledge the existing confusion as to whether portable video game consoles should be classed as traditional or mobile gaming platforms, and where hybrid consoles like Nintendo Switch fit into the classification. In this research, we include portable and hybrid consoles like Nintendo Switch among traditional gaming platforms, in line with the currently accepted definition in the industry [87].

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Unfortunately, "although academic research on video games has grown, marketing researchers still devote much less attention to this field than to other entertainment industries, such as movies, television or music" [9]. For instance, in the context of switching from traditional video games to mobile games, video game researchers have investigated the adoption of mobile games [10,11], players' loyalty towards mobile games [12,13], in-game goods purchase in mobile games [13–16], advertisements in online mobile games [17], and user experience in mobile games [18]. However, researchers and practitioners in the video game industry have yet to identify the factors that drive video game players to switch from traditional to mobile gaming, which thus hinders marketing researchers and practitioners' understanding about the players' gaming behaviours at the micro level under the environment of industry transformation.

To explore the variables that drive players to switch from traditional to mobile gaming, a human migration framework, the Push-Pull-Mooring (PPM) framework, is adapted to explain switching intention within the context of the video game industry, as this framework has been widely applied by marketing researchers to explain consumer switching behaviour [19–24]. The population for this study is Mainland Chinese players who have played traditional gaming before. The selection of this population is based on the following facts. Firstly, Mainland China plays a leading role in the current global video game market with a revenue of 22.1 billion U.S. dollars in 2018 [4], and is set to gross 50.7 billion U.S. dollars in revenue by 2021 [6]. Respect to the empirical part of our study, in a posteriori segmentation approach, the K-mean algorithm, was used in this study to explore the different behaviours in the players' subgroups. Later, we applied the linear regression to investigate the relationships between the independent variables and players' switching intention from traditional gaming to mobile gaming.

For academic researchers, our study provides pioneer empirical evidence on traditional and mobile gaming behaviour, which provides foundations for future confirmatory studies using a larger sample size. For industrial practitioners, this study helps them to better understand the dynamics of the video game industry, which therefore helps them to improve mobile game design and marketing strategies in order to adapt the needs of players. The findings are also potentially applicable to other areas of the media industry, where mobile devices are becoming the main distribution channel.

The paper begins with an overview of video game adoption and the PPM framework. There then follows an explanation of the propositions and methodology of the study. The empirical results are then presented, and a concluding section discusses the implications and limitations of the findings.

2. Conceptual framework

2.1. Motivations for playing video games

From the academic perspective, researchers have investigated consumers' motivations for playing video games since the introduction of the early generations of consoles [9]. The motivations of video game playing which have been identified so far include intrinsic motivations (fantasy, challenge, curiosity) [25], arousal, competition, entertainment, social interaction [26], habits and addictive tendencies [27], in-game autonomy and competence [28], and self-efficacy [29].

In the past decade, moreover, increasing numbers of researchers have examined the factors that influence gamer' intention to play mobile games thanks to the development of mobile technologies [16,30–42].

Regarding to the theoretical models which researchers have applied to explain player's adoption behaviour, several classical frameworks have been developed. The first theoretical model needed to be mentioned is Technology Acceptance Model (TAM) [43], which explains new end-users' information-systems acceptance process. The classical TAM has five core constructs; namely, Perceived Usefulness, Perceived Ease of Use, Attitude Toward Using, Behavioural Intention to Use, and Actual System use, with external variables affecting Perceived Usefulness and Perceived Ease of Use. Researchers have already applied determinants from TAM to explain video game players' adoption behaviour [10,36,39,44,45]. Besides, based on the TAM and other seven theoretical models, Venkatesh, Morris, Davis, & Davis [46] developed the Unified Theory of Acceptance and Use of Technology (UTAUT) model. According to UTAUT, 10 latent constructs and manifest variables should be considered when investigating users' acceptance of information technology, which are Performance Expectancy, Effort Expectancy, Social influence, Facilitating conditions, Behavioural Intention, User Behaviour, Gender, Age, Experience, and Voluntariness of Use. Determinants of UTAUT also have been applied by researchers to study video game players' adoption behaviour [31,41,47]. Additionally, Venkatesh, Thong, & Xu [48] introduced an improved version of UTAUT model, which is named UTAUT2. This updated version includes 12 latent constructs and manifest variables, which are Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Price Value, Habit, Behavioural Intention, Use Behaviour, Age, Gender, and Experience. Several researchers have applied UTAUT2 model to explain adoption behaviours of video games [35,49].

When considering the aforementioned studies, it is clear that these past knowledges about the players' adoption behaviours of video games may provide us with a good theoretical starting point. However, rather than video game adoption, our study addresses switching behaviour between of two different but closely connected technologies: traditional gaming and mobile gaming. In contrast to radical innovation adoption or first-time adoption, technology switching can be viewed as an instance of adopting an information system with incremental innovation [50]. Since no prior empirical evidence has shown that the aforementioned theoretical models of adoption behaviour have explanatory power for switching behaviours between different types of gaming, we turn to the PPM framework, the details of which will be provided in the following section.

2.2. Push-Pull-Mooring framework

Migration is defined as "*the movement of a person (a migrant) between two places for a certain period of time*" [51]. Migration researchers have shown that every act of migration must involve a well-defined starting point, a destination and a degree of permanence [19,22,51]. PPM, which combines the elements of the Push-Pull framework [52] with mooring factors [53,54], is a dominant paradigm in the field of migration research [19]. The PPM perspective describes human migration is subject to three effects: push effects, pull effects and mooring effects. Push effects refer to the negative forces which drive migrants away from their permanent residence, while pull effects are the positive forces attracting migrants towards a destination. Finally, mooring effects are the obstacles that prevent people from migrating from their current residence.

Although PPM was initially applied only in human migration research, it has since been extended to the field of marketing because of the similarity between human migration and consumer switching [21,23]. Bansal et al. [19] successfully verified the applicability of PPM in explaining service switching in the hairdressing industry. Later, the applicability of PPM in explaining technology service switching was proved by Ye et al. [21], in the context of Internet browsing. Hsieh et al. [23] used the PPM model to delineate the determinants of online service switching from blogs to Facebook. Bhattacherjee & Park [2] applied the PPM paradigm to explain users' switching from client-hosted computing to cloud computing. Thus, the PPM framework has successfully been applied in previous studies to explain consumer switching behaviour between offline and online services and is therefore proposed here to explain switching from traditional to mobile video game platforms.

In this study, switching between gaming platforms is similar to human migration. In the context of gaming switching, the starting point

for migration is traditional gaming and the destination is mobile gaming. Furthermore, the reduction in time spent on traditional gaming accompanied by an increase in time spent on mobile gaming is considered as the switching from traditional to mobile gaming.

3. Research model and propositions

Our research model is based on the PPM framework. Like actual migrants, video gamers engaged in the switching process are also subject to three effects: *push effects,* pushing them away from traditional gaming; *pull effects,* pulling them towards mobile gaming, and *mooring effects,* hindering them from abandoning traditional gaming. The following sections will introduce the specific variables for our research model, which will be classified according to the effects they produce. Fig. 1 describes our research model.

To our knowledge, there is no existing empirical research using the PPM framework to analyse video game players' switching behaviour. The lack of previous empirical literatures about the players' switching behaviours leads us to formulate propositions instead of hypotheses.

3.1. The components of push effects

There is a conceptual correspondence between the components of the push effects mentioned in the migration literature and many evaluative drivers of service switching intention, such as value, commitment, and price perception [19]. *Perceived time shortage for playing video games* (PTS), *Perceived time-consuming nature of traditional gaming* (PTC), and *Perceived expensiveness of traditional gaming* (PE) are the operationalisations of the mentioned theoretical components in the video game context.

Perceived time shortage for playing video games (PTS). Perceived time shortage refers to the individual's experience of lacking the necessary time to complete personal activities [55]. When traditional video game players experience a personal life change, their free time for playing video games may be reduced. However, their need for entertainment through gaming will persist, because it would be a long-term habit. When unable to achieve a specific means to satisfy certain needs, the individual may turn to a substitute [56]. Thus, with free time for traditional gaming decreasing and the need for entertainment remaining constant, it is reasonable to expect players to turn to mobile gaming in order to take advantage of its "fast to play, fast to end" nature. Besides, previous research shows that perceived time shortage strengthens the use behaviours of a specific mobile technology: mobile messages [55]. In other words, the time shortage factor functions as a force, pushing players away from traditional gaming.

Hence, the following proposition can be formulated:

P1. Perceived time shortage for playing video games is positively related to switching intention.

Perceived time-consuming nature of traditional gaming (PTC). Perceived time-consuming nature of traditional gaming refers to the perception that traditional gaming takes up more time to play. Previous researchers mentioned that the gaming time spent on mobile gaming may differ from the gaming time on traditional gaming [57]. Another interesting phenomenon among video game players is that people begin as heavy console/PC video game consumers, but, as time goes on, they turn to mobile gaming, which is usually considered a more leisurely form of gaming. A popular Chinese social Q & A website, Zhihu[2], posed an interesting question: Why do some people only play Hearthstone[3] (a mobile game) and no longer play World of Warcraft[4] (a PC game)? These two video games share some similar features, such as story and characters. The answers revealed a broad similarity of opinions: World of Warcraft is a Massively Multiplayer Role-Playing Game (MMRPG) on a traditional platform, requiring a huge time investment, and the fragmented free time of most people nowadays can only support the time input required for Hearthstone, which is considered a casual card game for mobile platforms.

This leads to the following proposition:

P2. Perceived time-consuming nature of traditional gaming is positively related to switching intention.

Perceived expensiveness of traditional gaming (PE). Economic issue is also worth considering in service migration models [19]. According to the rationale choice theory [58], consumers face a delicate balance between the costs paid for the use of a service, such as traditional gaming and mobile gaming, and the benefits yielded from using this service. Therefore, pricing issue needs to be addressed when considering the obstacles related to discontinuity of a service [59]. Respect to the empirical evidences, Karaiskos, Kourouthanassis, Lantzouni, Giaglis, & Georgiadis [60] found that perceived monetary value is the most decisive factor that drive consumers to use mobile data services. Additionally, pricing issue is also positively related to the behaviour intention to play mobile social network games [35,61]. Thus, video game players select games with reasonable prices [35], and consumers are more willing to switch if their incumbent service provider charges more than a potential competitor [19].

As well as the purchase cost of traditional gaming consoles, retail prices for traditional gaming are also much higher than for mobile gaming. In view of such a significant price difference, players may consider traditional gaming too expensive and decide to turn to mobile gaming. Although, throughout the whole customer lifetime cycle, some players may spend much more on in-app goods in mobile gaming than they would on traditional gaming. The high initial retail price of traditional gaming is a major threshold for players, which may eventually lead them towards mobile gaming. Thus, we make the following proposition:

P3. Perceived expensiveness of traditional gaming is positively related to switching intention.

3.2. The components of pull effects

Alternative attractiveness is an important theoretical component of the pull effects in both the migration and service switching intention literature [19]. In the video game context, we operationalised the alternative attractiveness as *Perceived network effects from mobile gaming* (PNE), *Perceived flexibility of mobile gaming* (PF), and *Perceived simplicity of mobile gaming* (PS).

Perceived network effects from mobile gaming (PNE). Network effects are the utility or value derived by product or service users from the network of other users of similar or compatible products [62]. In this research, we focus on the perception of the network effects. The value of a network grows as the number of its members increases [11]. When people perceive that large numbers of others are using a certain technology, they are more likely to adopt it themselves, and this phenomenon is more salient in their own social group [11,63]. There are several empirical findings linking perceived network effects to technology usage. For instance, Lin & Lu [64] that perceived network effects to be positively related to continuous use of social network sites. Sledgianowski & Kulviwat [65] found people intend to participate in social network sites when the number of users reaches a significant number. Wei & Lu [11] found empirical evidence of a positive relationship between perceived network effects and the intention to play mobile social

[2] URL: https://www.zhihu.com/question/34583233

[3] The complete name of Hearthstone is Hearthstone: Heroes of Warcraft, which is a freemium online collectible card video game developed by Blizzard Entertainment and released in 2014. Hearthstone has broadly the same features as World of Warcraft and was first released for Windows and Mac OS, with later support for IOS and Android devices.

[4] World of Warcraft is a massively multiplayer online role-playing computer game released in 2004 by Blizzard Entertainment.

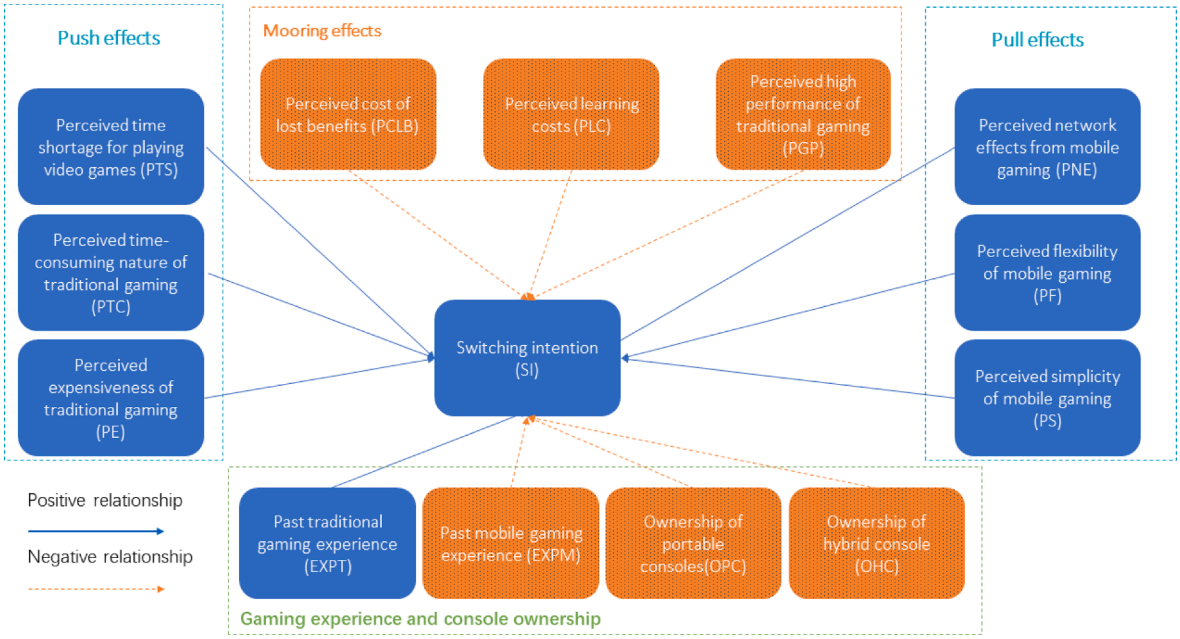

Fig. 1. Conceptual model.

games. J. Lee et al. [39] found that perceived number of friends is positively related to the intention to play mobile social network games.

We therefore propose the following proposition:

P4. Perceived network effects from mobile gaming are positively related to switching intention.

Perceived flexibility of mobile gaming (PF). Perceived flexibility of mobile gaming refers to video game players' perception that the mechanisms of mobile gaming allow that to play games anytime and anywhere. In addition, unlike traditional gaming, mobile gaming involves no time or place constraints, because mobile games run on electronic devices, such as smartphones or tablets, which players are usually able to carry with them. Therefore, the flexible feature of mobile gaming may greatly promote players to increase their frequency and duration in gaming [16]. Moreover, the mobile game mechanism enables players to begin and end their gaming sessions quickly. The characteristics of these mobile devices are therefore more accessible, portable and convenient than traditional gaming [11]. Meanwhile, compared with traditional gaming, time and access flexibility of mobile gaming can improve the service quality, which may gradually enhance players' dedication to this type of games [16]. Empirically supported evidence shows that time flexibility positively influences the adoption of mobile social games [11].

Thus, the following proposition can be formulated:

P5. Perceived flexibility of mobile gaming is positively related to switching intention.

Perceived simplicity of mobile gaming (PS). Perceived simplicity explains the degree to which users feel cheerful and find it easy to adopt and employ the system [66]. Perceived simplicity has been verified empirically as a key positive factor in the adoption of information technologies [23,43,67], online games [44], and mobile games [68]. The design of mobile gaming is generally more basic than is the case with traditional gaming, thus making learning to play easier. Besides, empirical results from previous research show that perceived simplicity is positively related to continuous intention to play mobile games [38]. Hence, we propose the following proposition:

P6. Perceived simplicity of mobile gaming is positively related to the switching intention.

3.3. The components of mooring effects

The conceptualisation of mooring effects in the migration and service switching literature includes several components, such as past behaviour and switching costs [19]. We operationalised these components in the video game context as *Perceived costs due to lost benefits* (PCLB), *Perceived learning costs* (PLC), and *Perceived high performance of traditional gaming (PGP)*.

Perceived switching costs. Switching costs are defined as "the one-time costs that customers associate with the process of switching from one provider to another" [69]. Switching costs play a vital role when users decide whether to switch or not[70]. Perceived switching costs in general are negatively associated with the switching intention [71]. More specifically, two different types of switching costs can be highlighted: *Perceived costs due to lost benefits* (PCLB) and *Perceived learning costs* (PLC).

Perceived costs due to lost benefits refers to the loyalty points, rewards, etc. that a consumer stands to lose by switching [72–75]. For example, players may lose their PlayStation Network membership if they decide to switch from PlayStation4 to a mobile platform such as IOS. Meanwhile, there are also perceived learning costs associated with the adaptation involved in switching [72,75,76]. Although their entertainment needs are served both by traditional and mobile gaming, some of the unique characteristics of mobile gaming may still make it hard for players to transfer all the knowledge they have acquired from traditional gaming to mobile gaming. Certain features, such as freemium games, which are ubiquitous on mobile platforms but are less epidemic on traditional gaming platforms, could complicate the adaptation process for players trying to adjust to the new gaming mechanism. Hence, we propose the following propositions:

P7. Perceived cost due to lost benefits is negatively related to switching intention.

P8. Perceived learning costs are negatively related to the switching intention.

Perceived high performance of traditional gaming (PGP). When players decide to switch to mobile gaming, gaming performance is undoubtedly one of the factors they take into account. Players' gaming performance requirements are increasing as video game hardware evolves. The video game industry is a 'cyclical business', which means that video game performance is heavily dependent on the technical capabilities of video

game hardware, which has experienced a dramatic evolution over the past 30 years [9]. As in other electronic industries, when a new video game console is released, the huge performance difference soon leads to the abandonment of the previous generation's hardware. For example, those used to the powerful 3D performance of PS4 games may find it hard to return to the age of the NES, when the game display consisted of a bitmap. Similarly, although mobile gaming is a more modern gaming form compared with traditional game, the performance of mobile gaming still cannot reach the output traditional gaming due to the limitation of the hardware of cell phones.

Based on the arguments stated above, the following proposition can be formulated:

P9. Perceived high performance of traditional gaming is negatively related to switching intention.

3.4. Past gaming experience

Past traditional gaming experience (EXPT) and *Past mobile gaming experience* (EXPM). Past experience has been found to be an important determinant of human behaviour [77]. "*When people act, they learn*" [78]. Learning means changes in an individual's behaviour arising from past experience [78]. Consumers tend to generalise from one purchase situation to another [79]. A positive purchase experience, for example, can motivate a shopper to return to the same supermarket and increase, the probability of this person going to this particular supermarket rather than another in the future. Thus, the previous purchase experience often leads to spatial or contiguous generalisation [79]. In information and technology user switching, when a user has more prior experience of using a particular technology product, he/she will be less likely to have the intention to use an alternative technology [21]. Previous research shows that prior experience can change the adoption intention or continued use of -learning websites [80]. The findings of Hsieh et al. [23] indicate that past social media usage experience hinders users' intentions to switch from blog to Facebook.

Based on the above review of previous research, we believe that past gaming experience also affects video game players' intention to switch to mobile gaming. The more traditional gaming experience people have, the more likely they are to continue with the same gaming option, and the same goes for those with more experience of mobile gaming., Hence, we formulate the following propositions:

P10. Past traditional gaming experience is negatively related to switching intention.

P11. Past mobile gaming experience is positively related to the intention to switch from traditional to the switching intention.

3.5. Portable and hybrid console ownership

Ownership of portable consoles (OPC). There is a possible cannibalisation effect between portable video game consoles (3DS and PSVita) and mobile gaming: a player who has a portable video game console may be less likely to switch to mobile gaming due to the similarities (mainly in terms of hardware) between portable and mobile gaming. The portable video gaming experience offers players some of the typical features of mobile games, such as touch screen, camera, gyroscope etc. Moreover, the similarity of the application scenarios for these two platforms may also cause the conflict of gaming time. Thus, the following proposition is established:

P12. *Ownership of portable consoles* is negatively related to the switching intention.

Ownership of hybrid console (OHC). Nowadays, portable consoles are not the only type of hardware equipped with mobile functionality. Nintendo introduced their latest generation of hardware in 2017 under the name of Nintendo Switch. To date, Nintendo Switch is the only existing hybrid console. This new hardware is equipped with hybrid functionalities and has three gaming models: TV model, Table model and Portable model. The TV model offers players the same experience as in traditional gaming, while the Table and Portable versions of the same hardware make gaming possible anywhere. As a result, we also posit a competitive relationship between hybrid consoles and mobile gaming.

Therefore, the following proposition is established:

P13. *Ownership of hybrid console* is negatively related to the switching intention.

4. Methodology

4.1. Measurement of variables and questionnaire design

All the variables in this research were measured on eleven-point Likert scales, ranging from "1″ to "11", where "1" stands for "Strongly disagree" and "11" stands for "Strongly agree".

Two pre-tests were conducted: one among students at a Spanish University and another among students at a Chinese University. In the Spanish University, 24 master students in Business Administration were invited to validate the measuring process in the pre-test. In the Chinese University, 16 students of all academic levels were recruited by a marketing research group to participate in the pre-test. The purpose of this was to confirm the accuracy of the translation of the questionnaire and identify ways to make it friendlier to Chinese respondents. Having achieved a satisfactory level of comprehension, the final questionnaire was drawn up (see Appendix A).

The questionnaire was originally written in English, then translated into Simplified Chinese and administered to survey participants from Mainland China. Before being administered, the Chinese questionnaire was translated back into English to remove any misleading statements or translation errors. All the questions were required to be answered, so there are no cases of missing data in completed questionnaires.

Care was also taken in this study to minimise common method bias issues, which are caused by the common method variance that is attributable to the measurement method rather than to the constructs the measures represent. [81]. Several factors may lead to the common method bias in marketing research, which includes low need for self-expression, context that arouse suspicion, and ambiguity [82]. To address these issues, we included some procedural remedies in the study. In the introduction to the questionnaire, respondents are informed that the survey is not a test or exam, and there are no correct or incorrect answers. All they need to do is state what they really think. In order to minimise any privacy concerns, the respondents are also told that the results of the survey are used exclusively for academic purposes. A glossary is also included to minimise any misunderstanding of the terminology (e.g. traditional gaming, mobile gaming, etc.) used in the introduction and in some questions.

4.2. Data collection and cleansing

The data were collected over the course of four weeks in the spring of 2018 using Qualtrics, an online questionnaire platform. The questionnaire was distributed through online discussion forums, where traditional gamers are more likely to be found. All the eligible respondents had the right to participate in a draw for an Amazon Gift card worth 100 RMB. The questionnaire was posted on 12 popular Chinese video game discussion forums, selected from the Alexa Index, a leading website-popularity measuring tool available on the Internet. In this phase, 799 samples matching the population (Players who have played traditional gaming before) were collected. Among these players, 779 respondents have also played mobile gaming before, 11 respondents have not played mobile games before, and 9 respondents did not give the answer. At the end, 358 respondents finished the entire questionnaire.

Among 358 respondents who finished the questionnaire, a multi-criteria data cleaning process was then conducted in order to mitigate non-sampling errors. The criteria include a survey provider mechanism allowing us to detect spam IPs; restriction of the sample to Mainland Chinese citizens, since they form the population for this study; the

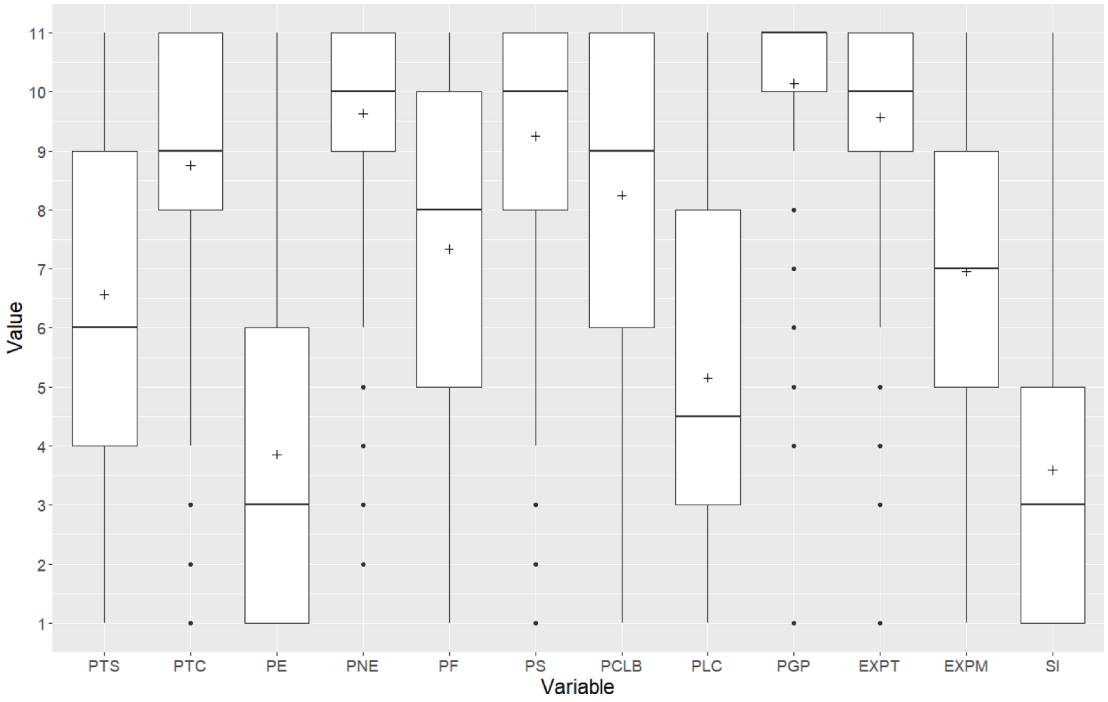

Fig. 2. Boxplots for the continuous variables.

removal of all observations with a variance of zero for the variables measured by the Likert scale to avoid acquiescence bias; restriction of the sample age range to the ages 10 to 80, assuming people in this age range to be able to understand and complete the questionnaire. Finally, other common-sense rules, such as the condition that participants in full- or part-time employment must have an income, were also applied. By the end of the data cleaning process, 340 samples remained in our dataset.

4.3. Modelling procedure

We first run clustering analysis using the K-Means algorithm to detect any groups of players with significantly different behaviour patterns. This is followed with a linear regression analysis using Ordinary Least Squares (OLS) estimation on all the observations in the dataset and the observations from the groups obtained from the K-mean clustering algorithm.

4.4. Software environment

The R programming language (R 3.5.0 with RStudio v1.1.453) is used in all the data analysis procedures, which include data inspection, data translation, data cleaning, descriptive data analysis, clustering and linear regression estimation.

5. Data analysis

5.1. Descriptive statistics

In terms of demographics, all the participants are citizens of Mainland China, and 95.1% (n = 323) are under the age of 35. The majority are male (n = 316, 92.90%) and only 24 (7.10%) are female. In terms of portable and hybrid console ownership, 36.47% respondents (n = 124) declare ownership of portable consoles (3DS or PSV), while 28.53% (n = 97) own the hybrid console (Nintendo Switch). Table 1 gives more detailed information about the categorical and nominal variables.

With respect to the descriptive statistics for the continuous variables (Appendix B), first, note that the mean value for PTS is 6.565, which

Table 1
Descriptive statistics for categorical and nominal variables.

Variables	Levels	Frequency	Percentage
Nationality	Mainland China	340	100%
Age	<= 20	25	7.40%
	21–25	131	38.50%
	26–30	109	32.10%
	31–35	58	17.10%
	36–40	15	4.40%
	>=41	2	0.60%
Gender	Male	316	92.90%
	Female	24	7.10%
Having children under the age of 14 ?	Yes	67	19.70%
	No	273	80.30%
Student	No	203	59.70%
	Yes (Part time)	15	4.40%
	Yes (Full time)	122	35.90%
Education	I have had no formal education	2	0.60%
	Primary school	0	0.00%
	Middle school	1	0.30%
	Vocational school	3	0.90%
	High school	10	2.90%
	Community college	25	7.40%
	Undergraduate	194	57.10%
	Master	76	22.40%
	PhD	29	8.50%
Job	No	121	35.60%
	Yes (Part time)	34	10.00%
	Yes (Full time)	185	54.40%
Income	Do not Know or No Answer	12	3.53%
	I have no income	75	22.06%
	<3000 RMB	7	2.06%
	3001 RMB-7000 RMB	104	30.60%
	7001 RMB-10000 RMB	37	10.90%
	>10,000 RMB	58	17.10%
Ownership of portable consoles (OPC)	Yes	124	36.47%
	No	216	63.53%
Ownership of hybrid console (OHC)	Yes	97	28.53%
	No	243	71.47%

indicates a moderate degree of perceived shortage of time for video gaming. Meanwhile, players are more likely to consider traditional video gaming more time-consuming than mobile video gaming (mean of PTC = 8.753). Furthermore, while players tend to disagree that traditional video gaming is more expensive than mobile video gaming (mean of PE = 3.853), the majority strongly perceive that traditional gaming perform better than mobile gaming (mean of PGP = 10.141, Kurtosis = 6.472). The PCLB and PL scores paint contrasting pictures: while the respondents tend to consider that switching from traditional to mobile gaming will imply loss of benefits (mean of PCLB = 8.244), the perceived learning costs is rated as relatively moderate (mean of PL = 5.150). Additionally, a high score of perceived network effects from mobile gaming is noted (mean of PNE = 9.632, Kurtosis = 2.620). This is accompanied by the perception that mobile gaming is relatively flexible (mean of PF = 7.332) and very easy for learning (mean of PS = 9.247). It is worth mentioning that players in our sample are more experienced in traditional gaming (mean of EXPT = 9.565) than mobile gaming (mean of EXPM = 6.950). Finally, the switching intention is relatively low (mean of SI = 3.594) among the respondents.

Descriptive statistics for the continuous variables can be found in Appendix B. Moreover, we visualised the descriptive statistics in Fig. 2 using boxplots, where several statistics, including the minimum, the maximum, the percentiles, and the mean (represented with cross symbol), are included.

5.2. Clustering analysis

In the first place, we applied the K-mean clustering algorithm to identify groups of players with similar profiles. Statistical criteria such as the Average Silhouette Width and the Calinski-Harabasz index indicated that the optimal number of clusters was two. These two clusters were profiled by tabulating the quantitative (Table 2) and qualitative variables (Table 3). There are more observations in the second cluster (n = 209, 63% of the total sample) than in the first (n = 131, 39% of the total sample).

The t-tests (Table 2) indicate that the majority of the mean differences are significant (P < 0.05), the exceptions being PTS, PE, EXPT, and age. This enables us to deduce that the players in cluster 1 are psychographically and behaviourally very distinct from those in cluster 2. It is worth noting that the latter exhibit a much higher switching intention than the players in cluster 1. There is also a huge difference in the mean value of PLC between the two clusters; the very high value (mean = 8.427) found in cluster 1 contrasting with the significantly lower value (mean = 3.096, p < 0.001) found in cluster 2.

Table 2
Mean values and t tests for mean differences of the continuous variables across clusters.

Variables	Cluster 1	Cluster 2	t	P value
Perceived time shortage for playing video games (PTS)	6.183	6.804	−1.842	0.067
Perceived time-consuming nature of traditional gaming (PTC)	9.328	8.392	3.377	0.001
Perceived expensiveness of traditional gaming (PE)	3.534	4.053	−1.470	0.143
Perceived high performance of traditional gaming (PGP)	10.420	9.967	2.777	0.006
Perceived costs due to lost benefits (PCLB)	9.267	7.603	5.784	0.000
Perceived learning costs (PLC)	8.427	3.096	22.689	0.000
Perceived network effects from mobile gaming (PNE)	9.244	9.876	−2.937	0.004
Perceived flexibility of mobile gaming (PF)	6.771	7.684	−9.030	0.000
Perceived simplicity of mobile gaming (PS)	8.702	9.589	−3.562	0.000
Past traditional gaming experience (EXPT)	9.763	9.440	1.612	0.108
Past mobile gaming experience (EXPM)	6.122	7.469	−4.436	0.000
Switching intention (SI)	2.771	4.110	−4.659	0.000
Age	27.466	26.383	1.908	0.058
Frequency	131	209		
Percentage of sample	39%	61%		

The results of the Chi-square tests, meanwhile, show that none of the variables in Table 3 is significantly different from zero (P > 0.05). Therefore cluster 1 and cluster 2 players cannot be easily distinguished through their demographic profile or portable/hybrid console ownership status.

5.3. Linear regression analysis

To meet the statistical assumptions for linear regression models, we did the log transformation for the dependent variable, switching intention, which is not normally distributed. After conducting the log transformation, linear regression assumptions were statistically validated using the approach of Peña & Slate [83]. The results show that statistical assumptions are met, which are summarised in Appendix C.

The results of the linear regression are given in the first column of Table 4. We first introduce the results of the global model before mentioning the results of the local models.

In terms of the results of the global model, among the push variables, neither PTS (β = 0.007, P > 0.05) nor PTC (β = -0.025, P > 0.05) is significant, suggesting low sensitivity to the time issue among these respondents and providing no support for P1 and P2. Besides, the results show that the PE has a positive influence on SI (β = 0.029, P < 0.05), thereby supporting P3.

With respect to the pull variables, the coefficients for PNE, PF, and PS are β = -0.025, (P > 0.1), β = 0.034, (P < 0.05), and β = -0.022, (P > 0.1) respectively. These results indicate that PF is the only significant pull factor towards SI. Thus, P5 is supported while P4 and P6 are not.

In terms of the mooring variables, PCLB is negatively associated with SI (β = -0.048, P < 0.01), while PLC shows no significance. Meanwhile, PGP is also negatively associated with SI (β = -0.063, P < 0.05). Therefore, P7 and P9 are supported, but P8 is not.

In terms of gaming experience, the association with SI is negative for EXPT (β = -0.078, P < 0.01) and EXPM (β = 0.073, P < 0.001). These results imply support for P10 and P11.

On the other hand, while OPC is not significant, OHC is negatively associated with switching intention (β = -0.270, P < 0.01). Thus, P12 is not supported while P13 is supported.

Among the demographic variables, only full-time student (β = 0.238, P < 0.1) and full-time job (β = 0.353, P < 0.05) prove significant, suggesting that SI is more likely to occur in the full-time employed or full-time students.

In global performance terms, the adjusted R^2 value in the global model is 0.245.

The subgroups obtained from the clustering analysis are also regressed to explore these two segments further. The linear regression results of the local models are shown in the second and third columns of Table 4. The adjusted R2 for the segments 1 and 2 regression models are 0.247 and 0.230, respectively. The linear assumptions of both models are also statistically validated using the Peña & Slate [83] approach. Note, also, that the coefficients of the following variables differ significantly between the two segments: PCLB (β = -0.063, P < 0.1), PLC (β = 0.108, P < 0.01), and PGP (β = 0.160, P < 0.05), while the coefficients of the rest of the variables are not significant.

The results of the clustering and regression analysis reveal two distinct segments of players, which we label as *Unshakable stayer* and *Moderate intentional emigrant*[5].

[5] These names are labels used by the researchers as subjective group-profile descriptions.

Table 3
Frequency, percentage, and Chi square tests for nominal and categorical variables across clusters.

Variables	Cluster 1		Cluster 2		χ^2	P value
	Frequency	% in cluster 1	Frequency	% in cluster 2		
Ownership of portable consoles					0.028	0.867
Yes	49	37%	75	36%		
No	82	63%	134	64%		
Ownership of hybrid consoles					0.058	0.809
Yes	47	36%	79	38%		
No	84	64%	130	62%		
Gender					0.961	0.327
Male	119	91%	197	94%		
Female	12	9%	12	6%		
Have children under the age of 14					0.566	0.452
Yes	29	22%	38	18%		
No	102	78%	171	82%		
Student					0.798	0.671
Yes (Part time)	7	5%	8	4%		
Yes (Full time)	44	34%	78	37%		
No	80	61%	123	59%		
Education					3.348	0.501
Have not reached university level	7	5%	9	4%		
Three-years college	13	10%	12	6%		
Undergraduate	72	55%	122	58%		
Master	26	20%	50	24%		
PhD	13	10%	16	8%		
Job					0.775	0.679
Yes (Part time)	13	10%	21	10%		
Yes (Full time)	75	57%	110	53%		
No	43	33%	78	37%		
Income					1.256	0.869
No income	31	24%	44	21%		
<3000 RMB	19	15%	35	17%		
3001 RMB-7000 RMB	45	34%	71	34%		
7001 RMB-10000 RMB	16	12%	21	10%		
>10,000 RMB	20	15%	38	18%		
Frequency	131		209			
Percentage of samples	39%		61%			

5.3.1. Segment 1: Unshakable stayers

The most prominent characteristic of this relatively small segment, (39% or n = 131 players), is a very low intention to switch from traditional to mobile gaming (mean = 2.771). Its members show a moderate level of EXPM (mean = 6.122) in contrast to their high level of EXPT (mean = 9.763), while their ratings for PLC show a mean value of 8.427.

SI in this segment is therefore mainly explained by PGP (β = -0.191, $P < 0.01$), EXPM (β = 0.092, $P < 0.001$), and OHC (β = -0.360, $P < 0.05$). The coefficient for PS is significant and negative (β = -0.047) at $P < 0.1$.

5.3.2. Segment 2: Moderate intentional emigrants

The members of this relatively large segment (61 %or n = 209 players) demonstrate a moderate degree of SI (mean = 4.110). They also have greater EXPM (mean = 7.469) (mean = 6.122) and less EXPT (mean = 9.440) than the Unshakable stayer group (mean = 9.763). PLC in this segment is very low (mean = 3.096).

In this segment, SI is positively influenced by PE (β = 0.036, $P < 0.05$), PF (β = 0.036, $P < 0.1$), PLC (β = 0.077, $P < 0.01$), and EXPM (β = 0.051, $P < 0.05$). In turn, PCLB (β = -0.050, $P < 0.01$), EXPT (β = -0.087, $P < 0.01$), and OHC (β = -0.254, $P < 0.05$) are all negatively associated with SI, while full-time employment affects it positively (β = 0.432, $P < 0.05$).

The results of the proposition testing on global model as well as on local models are given in Table 5.

6. Discussion

In this study, we examined a series of variables that may drive video game players to switch from traditional to mobile gaming. These variables are analysed within the PPM framework originally used in human migration studies. Three types of forces affecting players' intention to switch from traditional to mobile gaming are considered. The first are the so-called *push effects*, which are the performance weaknesses that push players away traditional gaming. The second are the *pull effects*, which are the strong points of mobile gaming that attract players. The third force is that exerted by *mooring effects*, that is, the retaining influence of the advantages of traditional gaming.

For our empirical work, we used *a posteriori* segmentation approach, K-mean clustering, to explore different behavioural patterns among the observations. The results reveal two distinct player segments, and that a considerable percentage of each segment (47.3% in the *Unshakable stayer* segment and 27.8% in the *Moderate intentional emigrant* segment) are extremely unwilling to switch (Likert point = 1) to mobile gaming. Furthermore, the players in the *Moderate intentional emigrant* group have a relatively higher mean value (mean = 4.110) of SI than those in the *Unshakable stayer* group (mean = 2.771), and the switching intention in the group with all observations is still low (mean = 3.594). These findings contrast with the earlier observation of a shrinking traditional gaming market due to a growing mobile gaming market [7,6]. These results reveal that actually traditional gaming is unlikely to be substituted by mobile gaming. In turn, mobile gaming seems to play a complementary role for the players of traditional gaming. One potential reason for the discrepancy between industrial level and individual level could be that the growth of mobile gaming is not in fact driven by existing players switching from traditional gaming, but by an influx of new players. Currently, the demographic player profile is changing due to the virtually ubiquitous nature of the Smartphone, making every owner a potential player [9].

Once we had two groups of observations given by K-mean clustering algorithm, we applied linear regression (OLS estimation) on all the observations and those from the two subgroups. This yielded a global

Table 4
Linear regression results.

Linear Regression Results			
	Dependent variable: log(SI)		
	All observations	Segment 1	Segment 2
Perceived time shortage for playing video games (PTS)	0.007 (0.014)	0.006 (0.022)	−0.004 (0.020)
Perceived time-consuming nature of traditional gaming (PTC)	−0.025 (0.017)	−0.037 (0.031)	−0.004 (0.021)
Perceived expensiveness of traditional gaming (PE)	0.029* (0.012)	0.003 (0.021)	0.036* (0.016)
Perceived network effects from mobile gaming (PNE)	−0.025 (0.023)	−0.039 (0.032)	−0.018 (0.036)
Perceived flexibility of mobile gaming (PF)	0.034* (0.014)	0.015 (0.020)	0.036^{+} (0.019)
Perceived simplicity of mobile gaming (PS)	−0.022 (0.021)	−0.047^{+} (0.028)	−0.017 (0.033)
Perceived cost of lost benefits (PCLB)	−0.048** (0.015)	0.012 (0.031)	−0.050** (0.018)
Perceived learning costs (PLC)	−0.009 (0.013)	−0.016 (0.029)	0.077** (0.028)
Perceived high performance of traditional gaming (PGP)	−0.063* (0.028)	−0.191** (0.058)	−0.039 (0.034)
Past traditional gaming experience (EXPT)	−0.078** (0.025)	−0.040 (0.043)	−0.087** (0.031)
Past mobile gaming experience (EXPM)	0.073*** (0.016)	0.092*** (0.026)	0.051* (0.023)
Ownership of portable consoles (OPC)	0.043 (0.088)	0.200 (0.143)	0.049 (0.114)
Ownership of hybrid consoles (OHC)	−0.270** (0.089)	−0.360* (0.151)	−0.254* (0.112)
Age	0.006 (0.012)	0.024 (0.017)	0.008 (0.017)
Gender	0.195 (0.156)	0.086 (0.222)	0.178 (0.222)
Having children under the age of 14	0.001 (0.104)	0.191 (0.150)	−0.019 (0.149)
Part time student	0.295 (0.214)	0.158 (0.344)	0.438 (0.288)
Full time student	0.238^{+} (0.141)	0.099 (0.255)	0.239 (0.175)
Three-years college	−0.112 (0.239)	−0.099 (0.345)	0.081 (0.334)
Undergraduate	−0.115 (0.193)	−0.146 (0.292)	0.044 (0.257)
Master	−0.049 (0.209)	0.237 (0.320)	−0.044 (0.274)
PhD	0.038 (0.253)	0.067 (0.376)	0.201 (0.337)
Part time job	0.001 (0.158)	−0.127 (0.248)	−0.033 (0.205)
Full time job	0.353* (0.162)	0.088 (0.271)	0.432* (0.202)
Income	−0.048 (0.048)	−0.045 (0.080)	−0.087 (0.060)
Constant	2.161*** (0.555)	2.829** (0.967)	1.586* (0.748)
Observations	340	131	209
R^2	0.301	0.392	0.322
Adjusted R^2	0.245	0.247	0.230
Residual Std. Error	0.709 (df = 314)	0.663 (df = 105)	0.709 (df = 183)
F Statistic	5.398*** (df = 25; 314)	2.709*** (df = 25; 105)	3.483*** (df = 25; 183)

Note: Values outside the parentheses represent regression coefficients.
Values inside the parentheses represent standard errors.
'***' P<0.001 '**' P<0.01 '*' P<0.05 '+' P<0.1'.

Table 5
Results of proposition verification.

	Segments		
Proposition/Independent variables:	All observations	Segment 1 (Unshakable stayer)	Segment 2 (Moderate intentional emigrant)
P1. Perceived time shortage for playing video games (PTS)	Not supported	Not supported	Not supported
P2. Perceived time-consuming nature of traditional gaming (PTC)	Not supported	Not supported	Not supported
P3. Perceived expensiveness of traditional gaming (PE)	**Supported**	Not supported	**Supported**
P4. Perceived network effects from mobile gaming (PNE)	Not supported	Not supported	Not supported
P5. Perceived flexibility of mobile gaming (PF)	**Supported**	Not supported	**Supported**
P6. Perceived simplicity of mobile gaming (PS)	Not supported	**Supported**	Not supported
P7. Perceived cost of lost benefits (PCLB)	**Supported**	Not supported	**Supported**
P8. Perceived learning costs (PLC)	Not supported	Not supported	**Supported**
P9. Perceived high performance of traditional gaming (PGP)	**Supported**	**Supported**	Not supported
P10. Past traditional gaming experience (EXPT)	**Supported**	Not supported	**Supported**
P11. Past mobile gaming experience (EXPM)	**Supported**	**Supported**	**Supported**
P12. Ownership of portable consoles (OPC)	Not supported	Not supported	Not supported
P13. Ownership of hybrid consoles (OHC)	**Supported**	**Supported**	**Supported**

model and two local models.

As for the global model, among the push effects variables, the perceived expensiveness of traditional gaming is found to have a positive effect on switching intention, which is consistent with the findings of Bansal, Taylor and James [19], albeit in a different context (hair stylist). Contrary to expectations, however, the results for perceived shortage of time for playing video games show no significant effects. This result was unexpected, which suggests that even players perceive that they are short of gaming time, their switching intention to mobile gaming is not affected. Besides, perceived time-consuming nature of traditional gaming is also not related to switching intention, and this result is consistent with the previous empirical findings [57]. This is somewhat unexpected as it makes intuitive sense that people might play mobile gaming in shorter sessions [57]. However, this result is comprehensible considering the evolution of mobile games over recent years (e.g. more advanced mobile gaming hardware allows for more sophisticated gaming mechanisms), which makes mobile gaming more time consuming than used to be the case.

Among the pull effects, we find a significant and positive relationship between perceived flexibility of mobile gaming and switching intention.

This finding is in line with the results of Wei and Lu [11], which show time flexibility to be positively associated with the intention to play mobile social games. Surprisingly, however, our proposition regarding the relationship between perceived network effects from mobile gaming and switching intention was not supported, thus contradicting the findings of Wei and Lu [11]. This discrepancy may be due to the difference in the research context. In the study of Wei and Lu [11], the participants of survey were mobile social game players. The central concept of social gaming is interacting with real people, and the total number of players and peers are key to whether or not the game is a success [84]. As a result, although the perceived network effects from mobile gaming is a significant variable in their research, this variable has not been verified as significant in our research, as we focus on the general setting of video games instead of a certain genre of games. Another unanticipated finding was the lack of any support for a relationship between perceived simplicity of mobile gaming and switching intention. Although this result differs from that of Ye and Potter [85], it is consistent with that of Hsieh et al. [23]. One possible explanation is the participants of our study are mainly hard-core players. Before switching to mobile gaming, these players have already accumulated a lot of experience of traditional gaming, which makes them not feel any significant difference regarding to the simplicity between these two types of gaming.

The results for the mooring effects support a relationship between perceived cost of lost benefits and switching intention, thus suggesting that the fear of losing benefits hinders players from switching. No significant association with perceived learning costs is found, however. Previous researchers tended to embed different types of switching costs in one latent concept [19,21,23,24,75]. However, our findings show that different types of switching costs do not affect switching intention in exactly the same way in the context of gaming switching. We observe a strong negative relationship between high perceived high performance of traditional gaming and switching intention, which indicates that players' switching intention is weakened mainly by the high performance of traditional gaming.

Apart from the push, pull and mooring effects, the other potential influences on players' switching intention discussed in this paper include past gaming experience, portable/hybrid console ownership, and demographic variables.

Past traditional gaming experience is found to influence switching intention negatively, while past mobile gaming experience affects it positively. These findings are consistent with those reported in Hsieh et al. [23], where lack of past experience on social media is negatively associated with intention to switch from blogs to Facebook. Contrary to our expectations, there is no significant link between ownership of portable consoles and switching intention. This unanticipated result may be due to the fact that, in recent years, portable consoles pose little threat to mobile gaming [7], the main competitor being the only existing hybrid console, Nintendo Switch.

In terms of the demographic variables, it is unsurprising to observe that being full-time student and full-time employment status are both positively associated with switching intention, because the flexible nature of mobile gaming adapts well to a busier pace of life. These results are also in line with the significant relationship between perceived flexibility of mobile gaming and switching intention, which we have mentioned before.

With respect to the relationships between the independent and dependent variables in each local model, with the exceptions of perceived learning costs and perceived high performance of traditional gaming, we find the same statistically significant coefficients in the Moderate intentional emigrant group as in the sample as a whole. It is somewhat surprising that the coefficient on perceived learning costs is positive in the Moderate intentional emigrant group, but non-significant in the Unshakable stayer group and in the whole sample. This could be due to the nature of video games as a form of entertainment. Players continually pursue new gaming experiences, and therefore keep challenging different games on different platforms. As a result, the increased difficulty of transferring knowledge from traditional to mobile gaming may eventually stimulate players' willingness to play mobile gaming. In the existing literature, however, provides no relevant theoretical explanation for this phenomenon, which is worth investigating in the future. In the Moderate intentional emigrant group, meanwhile, perceived high performance of traditional gaming is not significantly associated with switching intention, which reveals that the switching intention is stronger among players who are not too concerned about gaming performance.

In the Unshakable stayer group, we are surprised to find that perceived simplicity of mobile gaming is negatively associated with switching intention, which contrasts with earlier findings [21]. A reasonable explanation for this might lie in the nature of video games: if games are made generally too easy to play on certain platforms, players may feel less challenged and their intention to switch may decrease. The theoretical foundation of this claim is that when the challenge of an activity is below people's ability, they may feel bored [86]. A greater focus on this issue is suggested in future research.

6.1. Implications

This paper makes several contributions to the video game marketing literature; firstly, because it is the first empirical study of the migration of video game players from traditional gaming to mobile gaming, and the findings have major implications for further development of the PPM framework in the context of video game platform switching. Secondly, this study has enabled the identification of two groups of traditional players, one labelled *Unshakable Stayers;* and another labelled *Moderate Intentional Emigrants*. These findings have expanded the knowledge boundary of knowledge on the classification of video game players, which has until now been more focused on in-game behaviours.

Our findings also suggest several courses of action for video game industry practitioners. First, a relatively low switching intention score is observed in both the *Unshakable Stayers* group and the *Moderate Intentional Emigrants* group. Thus, it is unwise for marketing practitioners who promote mobile gaming to focus only on the existing traditional game players, because of their relatively low switching intention. Second, the significant relationship between the independent variables and switching intention shows some possible marketing solutions to attract traditional gaming players' attention on mobile gaming products. A marketing matrix worth practicing is that markers can reduce the price of mobile gaming, enhance the flexible gaming mechanism, and establish a content transferable program from their traditional gaming products to their mobile gaming products. Third, marketing practitioners should be aware that players do not switch to mobile gaming because they do not have enough time to play videogames, traditional gaming is too time-consuming, or mobile gaming is quite simple. As a result, it is not a wise decision to introduce a timesaving simplified mobile version of the original game on traditional platforms to attract traditional game players' attention. Third, video game companies about to launch a marketing campaign to direct traditional gamers to mobile gaming need to be aware that there are two behaviourally distinct player segments. As a result, marketing initiatives, such as price promotions and cross-platform data migration services may not work on all traditional gamers, since some are insensitive to such campaigns. Finally, marketing managers are further recommended not to aim marketing campaigns for their mobile gaming products at Nintendo Switch owners, because their switching intention is extremely low.

6.2. Limitations of this study

This study has several limitations. Firstly, because of the exploratory nature of this research, in the empirical body of this paper, all the variables in our empirical model are treated as manifest variables and measured on a single-item scale. This leaves future investigators the

opportunity to explore the dimensions within the variables using multi-item scales when conducting the confirmatory research.

Secondly, the use of judgement sampling limits the generalisability of the results. Future researchers are encouraged to apply quota sampling in order to control the gender and age composition of the sample, provided that credible official data are available.

Thirdly, our survey participants in general are experienced players in traditional gaming. Future researchers could recruit unexpected players in place of experienced players in their confirmatory study to examine whether these two player segments behave significantly different toward the switching to mobile gaming

Fourthly, all the participants in our survey were citizens of Mainland China. Samples from other countries might easily yield different results with respect to the sum of learned beliefs, values, and customs which drive consumer behaviour [56]. Caution is therefore required before generalising the findings of this research to other cultural contexts, and future researchers would do well to seek samples from other countries/regions when performing confirmatory analysis to validate the applicability of our empirical model.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. . Psychographic variables in the questionnaire.

All variables are measured on a scale of 1 (strongly disagree) to 11 (strongly agree).

Abbreviation	Statement
PTS	***Perceived time shortage for playing video games***
	My current time schedule doesn't permit me to devote much time to playing video games.
PTC	***Perceived time-consuming nature of traditional gaming***
	I think I need more time to play traditional video games than the mobile games.
PE	***Perceived expensiveness of traditional gaming***
	I feel it is more expensive to play traditional video games than mobile games.
PNE	***Perceived network effects from mobile gaming***
	I think that there is a great number of people around me who are playing mobile games.
PF	***Perceived flexibility of mobile gaming***
	I think that the mechanisms of mobile games allow me to play anytime and anyplace.
PS	***Perceived simplicity of mobile gaming***
	I think that learning to play mobile games is easy for me.
PCLB	***Perceived cost of lost benefits***
	I think that if I switch from traditional videogame console or PC to the mobile platforms, I will partially lose some of the benefits of being a long-term player of console or PC games.
PLC	***Perceived learning costs***
	I think it would be difficult for me to transfer all the knowledge and skill I have acquired from traditional gaming to mobile gaming.
PGP	***Perceived high performance of traditional gaming***
	In general, I think that the performance on traditional video game platforms is better than on mobile platforms.
SI	***Switching intention***
	I will decrease my time playing games on traditional videogame platforms in order that I can have more time to play on mobile platforms.
EXPT	***Past traditional gaming experience***
	I consider myself very experienced in traditional video gaming.
EXPM	***Past mobile gaming experience***
	I consider myself very experienced in mobile video gaming.

Appendix B. . Descriptive statistics for continuous variables.

Variables	Mean	SD	Skewness	Kurtosis	Quantiles					n
					0%	25%	50%	75%	100%	
Perceived time shortage for playing video games (PTS)	6.565	2.988	−0.268	−0.941	1	4	6	9	11	340
Perceived time-consuming nature of traditional gaming (PTC)	8.753	2.623	−1.210	0.650	1	8	9	11	11	340
Perceived expensiveness of traditional gaming (PE)	3.853	3.235	0.976	−0.200	1	1	3	6	11	340
Perceived network effects from mobile gaming (PNE)	9.632	1.809	−1.622	2.620	2	9	10	11	11	340
Perceived flexibility of mobile gaming (PF)	7.332	3.099	−0.546	−0.774	1	5	8	10	11	340
Perceived simplicity of mobile gaming (PS)	9.247	2.102	−1.490	2.244	1	8	10	11	11	340
Perceived costs due to lost benefits (PCLB)	8.244	2.894	−0.961	0.085	1	6	9	11	11	340
Perceived learning costs (PLC)	5.150	3.306	0.390	−1.047	1	3	4.5	8	11	340
Perceived high performance of traditional gaming (PGP)	10.141	1.629	−2.442	6.472	1	10	11	11	11	340
Past traditional gaming experience (EXPT)	9.565	1.848	−1.448	2.076	1	9	10	11	11	340
Past mobile gaming experience (EXPM)	6.950	2.727	−0.132	−0.926	1	5	7	9	11	340
Switching intention (SI)	3.594	2.769	1.007	0.236	1	1	3	5	11	340

Appendix C. . Tests of statistical assumptions of linear regression.

	Test	Statistic	p-value	Decision
All Observations (n = 340)	Global test	8.995	0.061	**Assumptions acceptable.**
	Skewness directional test	0.368	0.544	Assumptions acceptable.
	Kurtosis directional test	6.237	0.013	Assumptions NOT satisfied.
	Link function directional test	2.254	0.133	Assumptions acceptable.
	Heteroscedasticity directional test	0.136	0.713	Assumptions acceptable.
Segment 1 (n = 131)	Global test	5.844	0.211	**Assumptions acceptable.**
	Skewness directional test	5.595	0.018	Assumptions NOT satisfied.
	Kurtosis directional test	0.000	0.998	Assumptions acceptable.
	Link function directional test	0.172	0.678	Assumptions acceptable.
	Heteroscedasticity directional test	0.077	0.782	Assumptions acceptable.
Segment 2 (n = 209)	Global test	5.042	0.283	**Assumptions acceptable.**
	Skewness directional test	2.584	0.108	Assumptions acceptable.
	Kurtosis directional test	1.366	0.243	Assumptions acceptable.
	Link function directional test	1.047	0.306	Assumptions acceptable.
	Heteroscedasticity directional test	0.044	0.833	Assumptions acceptable.

Note: The statistics for each test are defined in Peña & Slate (2006).

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