

Explaining User Experience in Mobile Gaming Applications: An fsQCA Approach

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Abstract

Purpose

In the complex ecosystem of mobile applications multiple factors have been used to explain users' behavior, without though focusing on how different combinations of variables may affect user behavior. We show how price value, game content quality, positive and negative emotions, gender, and gameplay time interact with each other to predict high intention to download mobile games.

Design/methodology/approach

Building on complexity theory we present a conceptual model followed by research propositions. Our propositions are empirically validated through configurational analysis, employing fuzzy-set qualitative comparative analysis (fsQCA) on 531 active users of mobile games.

Findings

Findings identify ten solutions that explain high intention to download mobile games. Alternative paths are identified depending on the gender and the time users spend playing mobiles games. We highlight the role of price value and game content quality, as well as that of positive emotions which are always core factors when present.

Originality/value

To identify complex interactions among the variables of interest, fsQCA is employed, differentiating from traditional studies using variance-based methods, leading to multiple solutions explaining the same outcome. None of the variables explains intention to download on its own, but only when they combine with each other. We (1) extend existing knowledge on how price value, game content quality, emotions, gender, and gameplay time combine to lead to high intention to download mobile games, and (2) present a methodology for how to bridge complexity theory with fsQCA, improving our understanding of intention to adopt mobile applications.

Keywords (Required)

Content quality, experience, emotions, fsQCA, gender, price value

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Introduction

Electronic games are constantly evolving and they provide a big diversity regarding their content, their pricing strategies, and platform availability, all critical factors in influencing users' future behavior (Seo et al., 2015). Furthermore, mobile applications have greatly improved the past ten years, and the majority of consumption is performed through mobile applications, with application usage making up for 52% of the total digital media engagement (Lella and Lipsman, 2014). Users' download patterns become dynamic as they gain experience and develop different needs (Son, 2017) Video game industry, including mobile games (e.g., smartphone, tablet) has grown considerably in revenues leading to increased value creation for both the industry and the gamers (Marchand and Hennig-Thurau, 2013). In 2016, 19.2B downloads were made on Apple's "App Store" and Google's "Google Play" (SensorTower, 2017a). Also, in 2016 iPhone users spent on average \$40 per device on premium applications, more than they did in 2015, with mobile games dominating consumer spending (SensorTower, 2017b). It is thus critical to understand how to better design mobile games to satisfy the targeted users and increase value creation.

Extant research investigates how companies may offer increased value to consumers to gain a competitive advantage, as well as what factors can predict adoption of online and mobile games (Chang et al., 2013; Davis and Lang, 2012; Wei and Lu, 2014). Seminal work on marketing and IS disciplines consider perceived value to be a prominent determinant in forming processes of behavior toward pay-per-use services (Sweeney and Soutar, 2001; Zeithaml, 1988). With the main goal being to understand why consumers *buy what they buy* and how they make their choices, the Theory of Consumption Values (TCV) suggests that consumers attach different values to products and that these values influence their motivations to choose or purchase a product (Sheth et al., 1991). TCV has been extended to better capture consumers' value perceptions with previous studies showing that not all dimensions are equally important and, although they are interrelated, a change in one does not necessarily lead to a similar change to another dimension (Sheth et al., 1991; Turel et al., 2010). Indeed, as relations among variables are more complex, this suggests that they are more likely to be of asymmetrical form (Pappas, 2018; Pappas, Giannakos and Sampson, 2017; Woodside, 2014, 2017). Since most studies in the area assume symmetric relations between value dimensions and their variables (Park and Lee, 2011; Turel et al., 2010), it is likely that the current approaches or methods are not able to fully capture this complexity of perceived value. Methodology defines how we study a phenomenon, how we view it, and how we think about it (Bagozzi, 2007), thus it is essential especially when we want to get a deeper understanding of real-life phenomena.

Value comprises of price value, quality value, emotional value, and social value (Sweeney and Soutar, 2001), with all dimensions of value being important in predicting users' behavior depending on the context. To improve our understanding of how value perceptions relate with behavior in a complex and ever evolving environment such as the one of mobile gaming, further work is needed (Rezaei and Ghodsi, 2014; Zhou, 2013). In the context of mobile applications and games, perceived value, content quality, emotions, and various demographics are important antecedents of users' intention to download or use mobile applications and games (Hsiao and Chen, 2016; Su et al., 2016; Zhou, 2013). Previous studies show that price value is a main antecedent of users' intention to pay for extra content while playing, however it doesn't influence users' mobile game loyalty (Hsiao and Chen, 2016), which in general is expected to influence behavioral intentions. Also, in online gaming price value and quality may affect positively users' intention to repurchase online games (Rezaei and Ghodsi, 2014). Mobile games adoption is likely to increase if they are more fun (Liang and Yeh, 2011), especially for casual gamers than hardcore ones (Neys et al., 2014), as users will enjoy creative storylines (Ha et al., 2007). Also, although in mobile application adoptions male and female users may have different motivations (Liu and Guo, 2017), in the context of mobile entertainment no gender differences were found (Leong et al., 2013). Therefore, since these factors are critical for increasing users' behavior, they should be studied together to assess their effects on users' intention to download mobile games.

Multiple ways exist in which the aforementioned factors interact with each other, however more work is needed to understand how such interplays may offer a deeper understanding on adoption of mobile applications, and how they may lead to high intention to download mobile games. The majority of the studies in the area focus on main effects among the various antecedents and employs symmetric tests, [e.g., structural equation modelling (SEM) and multiple regression analysis (MRA)] to measure their effect on users' behavior. Regression based models (RBMs) build on

variance theories, which suggest that a predictor variable needs to be both necessary and sufficient condition to achieve the desired outcome. Indeed, focusing on symmetric and net effects may be misleading, since such effects do not apply to all cases in the dataset, thus the relationship between two variables is rather unlikely to be of symmetrical form (Ragin, 2008; Woodside, 2014). For instance, the presence of price value may be sufficient in explaining high intention to download, while if it is absent, intentions may still be high, suggesting that price value is not a necessary condition, hence, more work is needed towards this direction to complement previous studies. To address the gap in the literature, we are based on complexity theory and configuration theory to identify the different causal patterns of factors influencing intention to download mobile games. These theories build on the principle of equifinality, which suggests that multiple complex configurations of the same conditions can explain the same outcome (Woodside, 2014), and on causal asymmetry, which suggests that the causes explaining the presence of an outcome, are likely to be different from those explaining the absence of the same outcome (Ragin, 2008). Thus, the following research question is framed:

RQ: What conditions of price value, game content quality, positive and negative emotions, gender, and gameplay time are sufficient or necessary to create causal combinations that explain high intention to download mobile games?

To answer our research question, we employ configurational analysis using fuzzy-set qualitative comparative analysis (fsQCA) (Ragin, 2008). FsQCA provides multiple solutions that can explain an outcome, thus showing how intention to download mobile games is explained by its antecedents. When fsQCA is employed with complexity and configuration theories can lead to improved theory building (Fiss, 2011; Woodside, 2014), as it can identify the complex relations among variables. The findings offer multiple, distinct, and equally effective combinations of price value, game content quality, emotions, gender, and gameplay time, which explain high intention to download mobile games. The findings show that none of the factors is either necessary or sufficient in explaining intention to download mobile games on its own, instead it is their combinations that can lead to high intentions.

The contribution of this paper in the literature is twofold. First, we extend the literature by exploring how different types of gamers choose mobile games, through the lens of price value, game content quality, and emotions, as we examine their combined effects on intention to download mobile games. Second, we employ fsQCA, an innovative methodology for data analysis, which offers a deeper insight on the data, and should be considered as an alternative and complementary method to traditional variance-based approaches. Identifying the interplay among the aforementioned constructs should help managers and practitioners to specify detailed patterns of factors that stimulate gamers' behavioral intentions and help them create and offer better targeted mobile games with increased quality and value.

The paper is organized as follows. In Section 2, the theoretical background on price value, game content quality, and emotions is presented, along with discussion on the conceptual model and research propositions. Section 3 describes the research methodology and provides details on fsQCA and how it is implemented. Section 4 presents the empirical results from the configurational analysis with fsQCA. Finally, Section 5 discusses the findings highlighting theoretical, methodological, and practical implications, along with limitations and avenues for future research.

Background and research propositions

Perceived Value

The concept of perceived value in consumer research has been largely examined in economic, strategic and marketing literature, is defined as “the consumer’s total assessment and evaluation of the total utility of a product which is based on perceptions of what is received and what is given” (Zeithaml, 1988). Based on this value, consumers are expected to make a choice. The question of *why we buy what we buy* is a critical one in consumer behavior and marketing literature (Sheth et al., 1991). Why users play online games is a critical question and identifying gamers' motivation is important to be understood as online and mobile evolve over time (Demetrovics et al., 2011). The Theory of Consumption Values (TCV) suggests that consumers attach different values to products and that these values can influence their motivations to choose or purchase the specific products (Sheth et al., 1991). TCV draws from multiple consumer behavior models and suggests that consumer choice is based on multiple consumption values. *Consumption*

value perceptions include multiple dimensions of consumer utilities, like emotional value, price value, and quality (Sheth et al., 1991; Turel et al., 2010). TCV suggests that the dimensions are independent from one another and the existence of one influences the other, but a change in one dimension will not result to a change of a similar level to another dimension (Sheth et al., 1991). This indicates that the relation among dimensions is asymmetrical and that the typical variance-based approaches may not be able to fully capture their complexity.

The importance of the different dimensions of consumer value perceptions can change as it depends on the context. In the context of hedonic digital artefacts emotional values may be more important than functional values, while in an organizational context functional values may be more important (Turel et al., 2010). Consumers' perceived value is a multidimensional construct composing of price value, quality value, emotional value, and social value (Sweeney and Soutar, 2001). However, previous findings in the context of hedonic technologies show that social value has no effect on users' overall perceived value (Turel et al., 2010). Mobile games are considered as hedonic technologies since users choose to download or pay for them mainly because they enjoy it. Similarly, users' may not be influenced from the social aspect of value when examining in-app purchase intentions in mobile games (Hsiao and Chen, 2016) or purchase intention in online games (Rezaei and Ghodsi, 2014). Furthermore, a modified theory of consumption values for online gaming does not include social value, however it includes price and emotional values (Park and Lee, 2011). Thus, in the study we focus on price value, quality value, emotional value. However, due to the critical role of emotions in online environments and hedonic activities (Bagozzi et al., 2016; Pappas et al., 2016) and the fact that emotional value is mainly measured through positive emotions (Sweeney and Soutar, 2001), we differentiate and examine both positive and negative emotions to gain a deeper understanding on their role in forming users' intentions.

Price value and content quality of mobile games

Research on mobile application has received increased attention, mainly due to the evolution and expansion of contemporary technologies, with studies focusing on explaining user behavior and adoption. Various theories exist that explain user behavior and technology adoption [e.g., Theory of Reason Action (TRA), Unified Theory of Acceptance and Use of Technology (UTAUT)]. Various predictors of user behavior and adoption of mobile gaming applications have been examined, such as perceived value, content quality, flow experience, hedonic motivations, emotions, and various demographics (Hsiao and Chen, 2016; Su et al., 2016; Zhou, 2013), however this study builds on TCV and seeks to understand what drives a consumer to make a choice, thus we focus on perceived value as a main antecedent of user behavioral intentions. Every product or service, including mobile game applications, has a value and a price, thus the two characteristics are indispensable for one another (Rezaei and Ghodsi, 2014). Here, we define price value as users' perceptions that mobile games have a good value for money and are reasonably priced. Price value has a significant influence on users' intention to adopt mobile applications (Venkatesh et al., 2012) and online gaming (Rezaei and Ghodsi, 2014). Also, price value has been found as the main antecedent of in-app purchase intention in mobile games, however it had no effect on mobile game loyalty (Hsiao and Chen, 2016). Taking into account the increased penetration of mobile applications and the advancement of smartphones, it is critical to investigate the role of price value in predicting users' intention to download mobile games.

Next, we define quality value as users' perception on attractiveness, timeliness and personalization of mobile game content, that is game content quality. High quality has been found to increase users' satisfaction as it will make users feel good about using a certain service or product (Zhao et al., 2012). Also, quality may have a positive effect on users' intention to repurchase online games, (Rezaei and Ghodsi, 2014), since a game that is well made and performs consistently will increase users' intention to play it. Game content quality plays a significant role in the users' overall flow experience when playing mobile games (Zhou, 2013). The existence of numerous mobile games at different prices, creates many opportunities and options for the users to find the best game, based on their personal preferences and characteristics. However, high content quality may not always influence users' to pay a higher price for a game, even if it increases their repurchase intentions, (Rezaei and Ghodsi, 2014) indicating the existence of others factors influencing this relation or different types of relations among the variables, such as asymmetric relations. Thus, it is crucial to investigate how game content quality combines with price value, and other factors examined here, to better explain users' intention to download mobile games. Indeed, recent studies highlight the importance of emotions as they can significantly influence consumers' online behavior (Bagozzi et al., 2016; Pappas et al., 2014; Pappas et al., 2017a). As emotional value is inherent in consumers' perceived value, we need to examine how emotions may influence mobile gaming adoption, as they can have equivocal effects on users' intention to download mobile games.

The role of emotions on mobile games

The use of mobile game applications, as with all services, leads to different experiences for their users which may be either positive or negative, thus influencing their intentions to adopt them. Emotions have an important role in formulating users behavior, and recent studies identify different types of emotions as predictors of behavioral intentions in different fields [e.g., (Bagozzi et al., 2016; Pappas et al., 2014)] including mobile applications (Sutanto et al., 2013) and online gaming (Rezaei and Ghodsi, 2014). Users may decide to play a game because it arouses them and creates feelings of affect, leading to emotions, which might be either positive or negative depending on the game as well as on the overall gaming experience (Rezaei and Ghodsi, 2014). Mobile games adoption is likely to increase if they are more fun (Liang and Yeh, 2011) as users will enjoy more creative and solid storylines (Ha et al., 2007). Similarly, in the context of social media games, enjoyment increases gamers' continuous participation (Wu et al., 2018). Further, emotions are linked with users' perceptions of value towards the adoption of mobile applications (Liu et al., 2015) and online games (Rezaei and Ghodsi, 2014), raising the need to examine their interrelations with price value and game content quality in mobile gaming applications.

Previous studies have examined the role of specific types of emotions as predictors of user behavior in various contexts (Koo and Ju, 2010; Liu and Li, 2011). Emotions comprise of two major categories, the positive and the negative emotions, which are independent, universal and may exist at the same time (Bagozzi et al., 2016; Pappas et al., 2016; Pappas et al., 2017a). Thus, examining positive and negative emotions together can lead to a better explanation of user behavior, due to their interrelation, as well as to the different effect they can have on users' behavior (Barclay and Kiefer, 2014). Indeed, in the context of online services, positive and negative emotions can influence consumers' intentions in various ways, and might even neutralize each other (Pappas et al., 2016). Here, positive emotions are defined as the level that users feels happy, valued, and have a warm feeling when playing mobile games, and negative emotions are defined as the level that users feel irritated, in a bad mood, and upset when playing mobile games (Pappas et al., 2014). One may feel both types of emotions at the same time, for example when downloading a cheap or free game with good content users may feel happy by their choice or because they found it at a good price, but also feel irritated or upset if they have to view advertisements (if it is free) or if it promotes in-game purchases to get better content. Although emotions are correlated, their interrelation is asymmetric (Pappas et al., 2016), since the presence of one does not guarantee or exclude the presence of the other. Thus, it is critical to capture such asymmetric relations and identify what are the different combinations that explain users' behavior in mobile gaming.

Research propositions

The importance of mobile games and applications constantly increases as technology evolves, new markets are created, and the number of users grows. There is a call for research to go beyond the technological aspects of online gaming (Huang and Hsieh, 2011) and take into account users' value perceptions that may influence their behavior. Thus, following the previous discussion, there is a need to examine the adoption of mobile applications and especially of mobile games, by identifying the interrelations and combinations among critical factors that influence behavior in different settings, that is price value, game content quality value, and emotions (Hsiao and Chen, 2016; Rezaei and Ghodsi, 2014; Su et al., 2016; Sutanto et al., 2013). Also, we control for gender and time spent playing mobile games, to explain intention to download a mobile game for different types of users (Ha et al., 2007; Hsiao and Chen, 2016). Gender differences have been examined broadly in the area, though various results exist in the context of mobile applications, games, and services (Leong et al., 2013; Liu and Guo, 2017; Wu et al., 2018). In detail, a study in the context of mobile entertainment found no gender differences regarding adoption of mobile services (Leong et al., 2013), however this was not verified more recently, when it was found that male and female users of mobile applications have different motivations (Liu and Guo, 2017), as well as This raises the need to examine the role of gender in formulating behavioral intentions, in this context, and how it combines with price value, game content quality value, and emotions. We also examine the gameplay time (i.e., time that users spend each day playing mobile games), as literature on online gaming has identified different motivations and different behavior for users, depending on the amount of time they spend playing online games (Neys et al., 2014). For example, enjoyment can be a more important factors for casual gamers than hardcore ones (Neys et al., 2014). Different results exist on how the aforementioned factors influence gamers behavioral intentions, thus additional work is needed to obtain a

comprehensive overview of their role, and their interrelations, in explaining users' intention to download mobile games.

To address this gap, we explain users' intention to download mobile games by identifying configurations of causally related sets of factors. Relations between two factors (e.g., A, B) are complex, and the presence of one (A) may lead to the presence of the other (B), suggesting sufficiency. Further, factor B may be also present when A is absent, thus the presence of A is a sufficient but unnecessary condition for B to occur. Similarly, with the presence of other factors, A may be necessary but insufficient for B to occur. We posit that for different types of gamers there is a synergy between price value, game content quality and emotions in explaining high intention to download mobile games. Specifically, there is not one unique, optimal, configuration of such values, but multiple and equally effective configurations of causal conditions exist, which may include different combinations of predictors of gamers' intentions. This approach allows the identification of asymmetrical relations among the examined factors and the outcome.

To visualize these relations, we designed a conceptual model (Figure 1) illustrating five independent variables and their intersections, as shown on the left, and the outcome of interest, on the right. The overlapped areas represent possible combinations among factors, that is, areas that one factor may exist together with the other factors. Also, to identify such patterns of factors in a complex system as adoption of mobile games and applications, formulating hypotheses, common in variance-based methods that are framed as correlational expressions, does not allow for a holistic approach that will lead to the identification of multiple solutions. Indeed, technology adoption models and theories need to evolve to capture the complexity of phenomena under investigation (Bagozzi, 2007). Thus, we employ configuration theory approaches in which research propositions are formulated as causal recipes to capture the different combinations among factors, and theoretically specify which should be present or absent from the causal recipe (El Sawy et al., 2010; Fiss, 2007; Ragin, 2008).

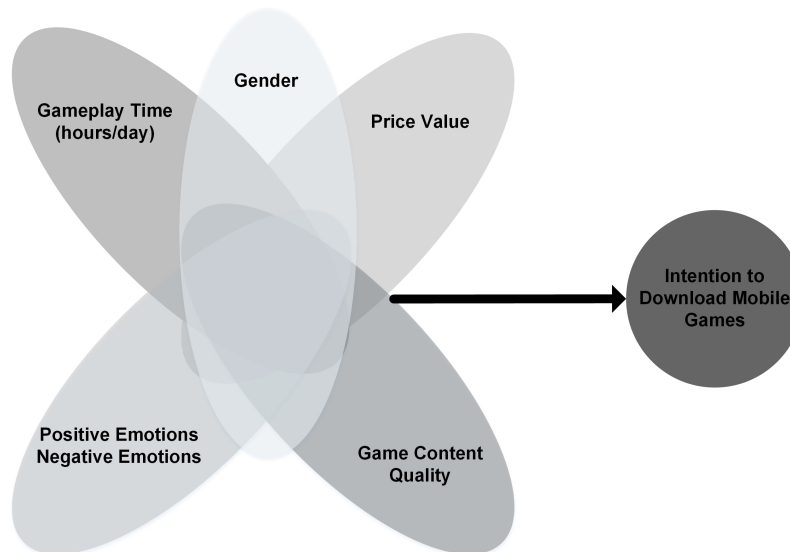


Figure 1. Venn diagram illustrating the conceptual model that explains intention to download mobile games

Complexity theory and theory of configuration build on the principle of equifinality, which suggests that a result may be equally explained by alternative sets of causal conditions (Fiss, 2011; Woodside, 2014). In a complex system, relations among factors (i.e., causes) are complex and depending on how they combine together, both high and low conditions of a certain factor may explain high scores of an outcome. These conditions may be combined in sufficient configurations to explain the focal outcome (Fiss, 2011; Woodside, 2014). Price value, game content quality, positive and negative emotions, gender and gameplay time are important causal conditions for understanding intention to download mobile games occurs through the different combinations of price value, game content quality, positive and

negative emotions, gender and gameplay time, thus they may interact with each other in various configurations. Studies show that users' perceptions on price value, game content quality, and emotions vary, and they may consider different sets of attributes before using a mobile application or service (Liu and Li, 2011; Rezaei and Ghodsi, 2014). For example, users may download a mobile game because of its low price even if they are not satisfied with the game content. Also, users may decide to download a more expensive mobile game with a not so good content because they feel happy playing it, or because they spend many hours playing during the day, thus they play many games.

Next, configuration theory proposes the concept of causal asymmetry, which means that, for an outcome to occur, the presence and absence of a causal condition depends on how this condition combines with the other conditions (Fiss, 2011; Woodside, 2014). A predictor variable may have an asymmetric relation with the outcome, which means that even if one variable is *insufficient* for the outcome to occur, it is still able to serve as a *necessary* condition for the outcome variable (Fiss, 2007; Fiss, 2011; Woodside, 2013). In this case, a necessary condition is a variable that is present, at least to a degree, in every configuration that explains the outcome, making it indispensable to the outcome. In other words, different values of the same condition (i.e., high and low levels of a factor) may appear in different combinations explaining intention to download mobile games, depending on how these conditions combine with each other. For example, high intention to download may be achieved through both high and low perceptions towards price, depending on how good the game content is perceived to be, or how the users' feel when they play. Thus, for the conditions explaining high intention to download mobile games, it is important to examine how the presence or absence of price value, for different types of users, will influence the presence or absence of game content quality or emotions, and vice versa. Similar interrelations may exist among all adoption values.

Following the above discussion, it is common in studies that employ fsQCA to make propositions that describe the various configurations and asymmetric relations among variables that explain the outcome of interest [e.g., (Leischnig and Kasper-Brauer, 2015; Pappas et al., 2016)]. Here, we assume that such propositions hold true, and we formulate specific testable propositions which include configurations that are expected to hold true for a part (small or large) of the sample. This, in addition to identifying all the possible solutions that explain high intention to download mobile games, we will also identify within the sample specific cases, or persons, (who and how many) that will have high intentions depending on specific antecedent conditions (if they are high or low/medium).

Proposition 1: Users' having high *price value, high game content quality, and high positive emotions*, will have high intention to download mobile games.

Proposition 2: Users' having *high game content quality and high positive emotions* will have high intention to download mobile games.

Proposition 3: Users' *high price value, high game content quality, high positive emotions, and high negative emotions* will have high intention to download mobile games.

Proposition 4: Users' having *low price value, high game content quality, and high positive emotions* will have high intention to download mobile games.

Proposition 5: Users' having *low gameplay time and high positive emotions* will have high intention to download mobile games.

Proposition 6: Users' having *high price value, low game content quality, and high positive emotions* will have high intention to download mobile games.

Methodology

Sampling

This study employs a survey conducted through the delivery and collection of individual questionnaires, following a snowball sampling methodology to attract respondents. To find appropriate sample, experienced mobile gamers were contacted (i.e., individuals that play games on their mobile devices), who then forwarded the survey to their business and personal contacts. The respondents were asked to answer based on their personal evaluations and perceptions

towards mobile games. Also, they were asked to state their experience with mobile games. Users with no previous experience were removed from the sample. We aimed at about 1800 users, out of which 593 responded, and 531 play mobile games, thus comprising the sample of this study. The sample consists of more males (60%) than females (40%). Most (47%) are younger than 28 years old, followed by users between 29 and 35 years old (26%). Also, 19% are between 36-45 years old, and the rest (8%) are 46 years old or older. Finally, the sample is rather diverse regarding employment as it consists of 38% private employees, 32% students, 25% state employees, and 5% retired or unemployed.

Measures

Respondents were asked about their demographic characteristics, as well as about the constructs as identified in the background section. The Appendix presents the definitions of the adopted constructs and their source in the literature. In all cases, except gameplay time, 7-point Likert scales (1 Not at all - 7 Very Much) are used to measure the constructs. Gameplay time is defined as the hours (approximately) that users spend playing mobile games during the day. All items along with their descriptive statistics and loadings are also presented in the Appendix.

Next, we evaluate the constructs for reliability with the Composite Reliability and Cronbach alpha indicator, which needs to be higher than .7 for every factor. Construct validity requires average variance extracted (AVE) to be higher than .50 (Fornell and Larcker, 1981), the correlation between variables in the confirmatory models shall not exceed .8, which would indicate low discrimination, and the square root of each factor’s AVE shall be greater than its correlations with the other factors (Table 1). Also, variance inflation factor (VIF) for every variable is below 3, thus multicollinearity is not an issue (O’Brien, 2007). Based on the common latent factor technique and the CFA marker variable technique, common method bias is not an issue, as their values are .08 and .21, respectively (Podsakoff et al., 2003).

Table 1. Descriptive statistics and correlations of latent variables

Construct	Mean	SD	CR	AVE	Construct				
					1	2	3	4	5
1. Price Value	4.06	1.39	.93	.81	.90				
2. Game Content Quality	4.63	1.25	.89	.72	.65	.85			
3. Positive Emotions	4.66	1.43	.94	.82	.51	.62	.91		
4. Negative Emotions	2.62	1.60	.95	.86	.02	-.07	-.01	.93	
5. Intention to download	4.96	1.42	.93	.76	.48	.64	.72	-.15	.87

Note: Diagonal elements (in bold) are the square root of the average variance extracted (AVE). Off-diagonal elements are the correlations among constructs (all correlations higher than 0.1 are significant, $p < 0.01$). For discriminant validity, diagonal elements should be larger than off-diagonal elements.

Fuzzy-set Qualitative Comparative Analysis

The study applies fuzzy-set Qualitative Comparative Analysis (fsQCA), which integrates fuzzy set and fuzzy logic with QCA (Ragin, 2008). FsQCA identifies patterns of elements (i.e., configurations), among independent and dependent variables, and goes beyond the traditional analyses of variance and MRAs (Woodside, 2014). Also, these patterns of independent variables, may lead to solutions that are not identified by MRAs, as their effect on the outcome exists only for a small number of cases (Woodside, 2014), in contrast to the main effects. The benefits of configurational analysis and fsQCA mainly occur from the limitations of regression-based methods (El Sawy et al., 2010; Liu et al., 2017; Pappas et al., 2016; Pappas, Giannakos and Sampson, 2017; Woodside, 2013, 2014). Regression based methods take a net effect approach in examining the effects among factors of interest and the variables are examined in a competing environment. The covariance among the variables in a model suggests that the presence or

absence of one variable influences their effect, both on the other variables and the on the rest as well as on the expected outcome, adding to the importance of applying configurational analysis, which is based on this notion (Fiss, 2007).

FsQCA offers two types of configurations, which are created with both necessary and sufficient conditions, and provides multiple solutions explaining the same outcome, on which the configurations may be present, absent, or on a “do not care” condition (i.e., either present or absent). Necessary and sufficient conditions create a distinction among core (i.e., strong causal condition with the outcome) and peripheral elements (i.e., weak causal condition with the outcome) (Fiss, 2011). First, an analysis of necessity is performed, which will identify if any of the causal conditions is a necessary (i.e., indispensable) condition for the presence of intention download mobile games, that is high intention download mobile games. Necessity, from a set theory approach, means that a condition is a superset of the outcome (Ragin, 2006), thus for each case in the sample, the fuzzy-set membership score of the outcome is smaller than the fuzzy-set membership score of the causal conditions. For a condition to be necessary, its consistency should exceed the threshold of 0.9 (Schneider and Wagemann, 2010). Consistency is the degree to which the cases in the sample that share a causal condition or configuration agree in displaying the focal outcome (Ragin, 2006). To examine necessity, the dedicated function in fsQCA software is used, which calculates the consistency and coverage scores for every causal condition and their negation.

Data Calibration

Next, the variables need to be calibrated into fuzzy sets, by giving them values from 0 to 1, on which 1 stands for the full-set membership and 0 the full non-set membership. For data calibration, three thresholds need to be defined, that is full membership, full non-membership and the cross-over point, which represent the level that a case belongs to a set (Ragin, 2008). This way of calibration is the direct method of calibration. In the direct method, the researcher chooses three qualitative thresholds, whereas in the indirect method, the measurements require rescaling based on qualitative assessments. Either method may be chosen based on the data and the underlying theory. Here, the procedure employed by Pappas et al. (2016) is followed, so the three thresholds are based on the questionnaire scale (7-point Likert scale). Similar calibration approaches are common in previous studies (Ordanini et al., 2014; Pappas, 2018). The full membership threshold is set at the value of 6; the full non-membership is set at value 2; and the crossover point is set at value 4. All values are calibrated on a logistic function to fit into the three thresholds.

Obtaining the Solutions

Next, fsQCA produces a truth table of 2^k rows, where k represents the number of outcome predictors and each row represents each possible combination. For instance, a truth table between two variables (i.e., conditions) provides four possible logical combinations between them. The truth table needs to be sorted based on frequency and consistency (Ragin, 2008). Frequency refers to the number of observations for every combination. Consistency refers to “*the degree to which cases correspond to the set-theoretic relationships expressed in a solution*” (Fiss, 2011). A frequency cut-off point should be set to ensure that a minimum number of empirical observations is obtained. For small and medium-sized samples, a cut-off point of 1 is appropriate, but for large-scale samples [e.g., over 150 cases], the cut-off point should be set higher (Ragin, 2008). Here, the frequency cut-off point is set at 3 (Fiss, 2011). Also, a low consistency threshold leads to the identification of more necessary conditions, reducing type II errors (i.e., false negatives), but increasing type I errors (i.e., false positives) (Dul, 2016). Thus, a relatively high consistency threshold is set at $>.85$; not too high, but higher than the recommended value of 0.75.

Findings

First, we ran an analysis of necessity. For the presence of intention to download mobile games consistency values range between 0.25-0.73, for both the presence and absence (i.e., negation) of the causal conditions. None of the causal conditions exceeds 0.9 (Schneider and Wagemann, 2010), that is the threshold for a condition to be considered as a superset of the outcome of interest, thus, none of them can be considered necessary for high intention to download mobile games. Since none of the conditions is indispensable (necessary) to the outcome, we proceeded with the fuzzy set analysis, the main analysis of this study, to identify sufficient combinations of the causal conditions that explain

high intention to download mobile games. Table 2 presents the outcomes of the fuzzy set analysis for high intention to download mobile games. Black circles (●) represent the presence of a condition, crossed-out circles (⊗) its absence (Fiss, 2011) and blank spaces indicate a “do not care” situation (i.e., a causal condition may be either present or absent). Large circles symbolize core elements of a configuration, and small circles peripheral ones. Table 2 includes set-theoretic consistency values for each configuration as well as for the overall solution, with all values being above the threshold (>0.75). Consistency measures the degree that a subset relationship has been approximated, and coverage assesses the empirical relevance of a consistent subset (Ragin, 2008).

Table 2. Configurations leading to high intention to download mobile games

Configuration	Solutions									
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Gameplay Time (>1 hour/day)				⊗	●	●	●	●	⊗	
Gender (Males)				●	●	●	⊗	⊗	⊗	⊗
Price Value		●	⊗		●	●	⊗	⊗	●	⊗
Game Content Quality	●	●	⊗			●	●	●	●	⊗
Positive Emotions	●	●	●	●	●		●			●
Negative Emotions	⊗			●	⊗	⊗		⊗	⊗	●
Consistency	.96	.96	.93	.92	.96	.95	.94	.95	.93	.94
Raw Coverage	.64	.59	.07	.16	.19	.19	.11	.09	.07	.06
Unique Coverage	.08	.07	.01	.01	.01	.01	.02	.01	.01	.01
Overall solution consistency		.937								
Overall solution coverage		.791								
Note: Black circles (●) indicate the presence of a condition, and circles with “x” (⊗) indicate its absence. Large circles indicate core conditions; small ones, peripheral conditions. Blank spaces indicate “don’t care”.										

The overall solution coverage indicates the extent that high intentions can be determined based on the identified configurations and is comparable to the R-square value. An overall solution coverage of .791 suggests that the ten solutions accounted for a substantial proportion of the outcomes.

For high intention to download mobile games, solutions 1-10 present combinations for which the different factors may be present or absent depending on how they combine with each other. Specifically:

Solutions 1 and 2: All types of users, who perceive content quality to be high and they feel happy or satisfied when playing mobile games, they will have high intention to download a game, if negative emotions are not high or if the price value is high. These findings are intuitive considering the importance of quality, price value, and emotions in the adoption of mobile applications. Indeed, the raw coverage shows that the two solutions explain a very large part of the sample.

Solution 3: There is a small part in the sample, regardless of gameplay time and gender, who have high intention to download mobile games when they feel happy and satisfied playing them, even if the price value and content quality. This solution complements solutions 1-2, as it explains a smaller sample and shows that even with the absence of the same values the same outcome can be achieved.

Solution 4: Male gamers with low gameplay time, can have high intention to download mobile games when both positive and negative emotions are high, regardless of quality and price value. This solution points to occasional

gamers, who download mobile games without putting too much focus on value and content, and may end up with both positive and negative emotions from such experiences.

Solutions 5-6: Male gamers with high gameplay time, have high intention to download a mobile game when negative emotions are low or medium, and high price value is combined with either high positive emotions or high game content quality. This shows that users who play often during the day know what they are looking for, want to have fun, and do not want to overspend, pointing towards heavy gamers.

Solutions 7-8: For female gamers with high gameplay time, high game content quality is very important, as it combines with the presence of positive emotions or the absence of negative ones, with price value being at low or medium levels in both cases. This finding shows that female heavy gamers are willing to spend more money if they believe that a game is of high quality, differentiating from the male gamers in solution 5-6.

Solution 9: Female gamers with low gameplay time, will have high intention to download a mobile game when both price value and game content quality are high, with negative emotions being at low or medium levels. This highlights the importance of value and content for female users, compared to male users in solution 4.

Solution 10: Finally, for a small part of female gamers, high intention can be high when both emotions are also high, with price value and game content quality being at low or medium levels. This finding shows the importance of emotions, as they may help in overcoming perceptions of low value or content quality, pointing to users with different motivations when downloading mobile games. For example, users who download a mobile game in order to receive some type of service, such as free Wi-Fi, or participate at a contest.

The findings offer support for propositions 1 as the combination of high price value, high game content quality, and high positive emotions is sufficient to achieve high intention to download mobile games (solution 2). Regrading proposition 2, the findings show that high game content quality and high positive emotions are necessary conditions in specific combinations but are not sufficient as they need to be combined with either low/medium negative emotions (solution 1) or for female gamers with high gameplay time who also have low/medium price values (solution 7). The findings provide support that multiple combinations of sufficient and necessary conditions exist that explain high intention to download mobile games.

Furthermore, we test specific propositions to identify how the defined configurations explain the outcome of interest (i.e., high intention to download mobile games), and especially for which cases and for how many in our sample. This is done by computing the specific configuration in fsQCA software and plotting it against the outcome of interest. The process on how to compute a specific configuration is described in detail in Pappas (2018). In the plots, “*” means *and*, “~” means *not*. We measure the coverage and consistency for every configuration to see how much and how strongly it explains the outcome. Furthermore, because configurations with consistency larger than 0.80 are useful and may be used for advancing theory (Woodside, 2017), we highlight how many cases within the sample have both high intention to download mobile games (over 0.7) and consistency 0.8 or larger.

Figure 2 presents the fuzzy XY plots for testing propositions 3 and 4 and identifies cases that represent persons in the sample for which their intention to download mobile games can be either high or low/medium (i.e., not high). The findings support this proposition as it explains 21% of the sample (coverage = 0.21) with a high consistency of 0.96. Also, findings show 21 persons with *high price value, high game content quality, high positive emotions, and high negative emotions* (scores over 0.7), out of which only 19 have high intention to download mobile games (scores over 0.80). Thus, proposition 3 includes only 21 cases, but 19 out of 21 will have high intention to download mobile games (upper right corner). Next, the findings support proposition 4 as it explains 39% of the sample (coverage = 0.39) with a high consistency of 0.95. Also, proposition 4 includes 16 cases (persons with *low price value, high game content quality, and high positive emotions*), but 9 out of 16 will have high intention to download mobile games (upper right corner).

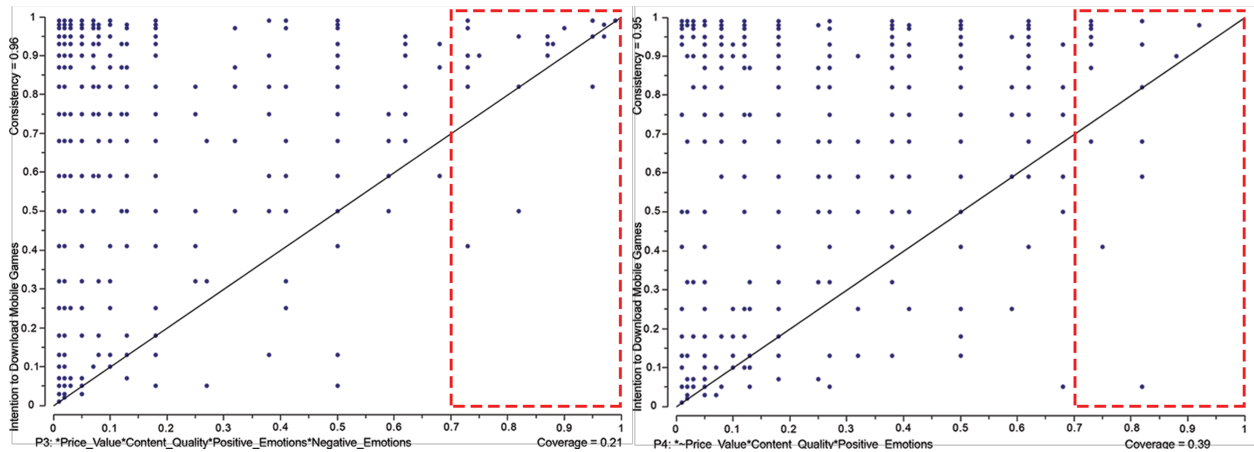


Figure 2. Fuzzy XY plots for testing propositions 3 and 4. The propositions identify cases that have values over 0.7 but intention to download mobile games can be either high or low, describing different persons in the sample.

Similarly, Figure 3 presents the fuzzy XY plots for testing propositions 5 and 6 identifying the cases for which their intention to download mobile games can be either high or low/medium. The findings support proposition 5 as it explains 30% of the sample (coverage = 0.30) with a high consistency of 0.88. Also, findings show 47 persons with *low gameplay time and high positive emotions* (scores over 0.7), out of which only 33 have high intention to download mobile games (scores over 0.80). Thus, proposition 5 includes only 47 cases, but 33 out of 47 will have high intention to download mobile games (upper right corner). Lastly, the findings support proposition 6 as it explains 27% of the sample (coverage = 0.27) with a high consistency of 0.92. Also, proposition 6 includes 8 cases (persons with *high price value, low game content quality, and high positive emotions*), but only 1 out of 8 will have high intention to download mobile games (upper right corner).

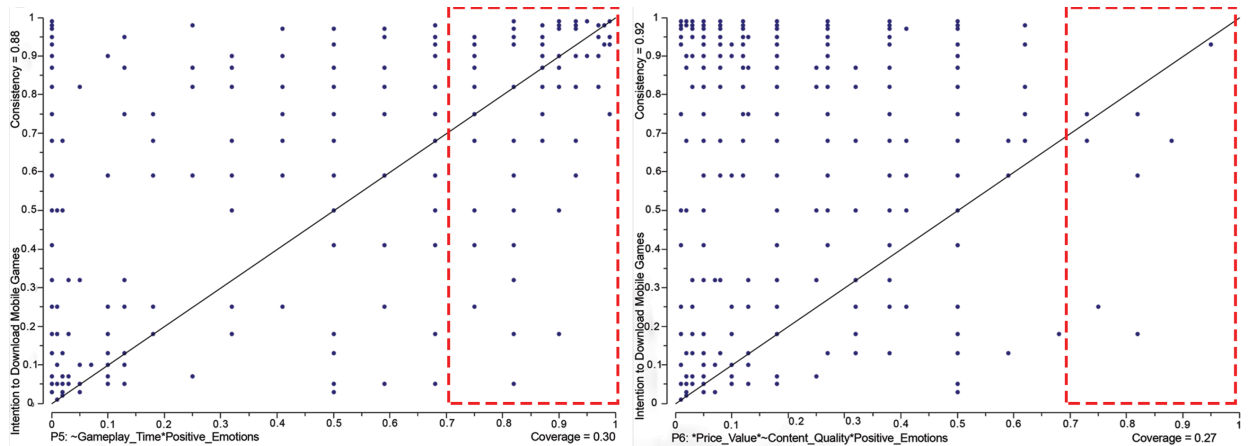


Figure 3. Fuzzy XY plots for testing propositions 5 and 6. The propositions identify cases that have values over 0.7 but intention to download mobile games can be either high or low, describing different persons in the sample.

The configurations identified through propositions may not correspond to a specific solution identified by fsQCA, instead they allow us to identify what *conditions of price value, game content quality, positive and negative emotions, gender, and gameplay time are sufficient or necessary to create causal combinations that explain high intention to download mobile game, answering our research question. Furthermore, these configurations allow us to capture specific cases, or persons (who and how many), within the sample that will have high intention to download mobile game, depending on specific antecedent conditions (if they are high or low/medium)* (Pappas, 2018; Woodside, 2017).

The asymmetric analysis shows that high scores on a configuration may occur for high scores on the outcome condition, making the configuration useful for researchers. However, a configuration does not predict all cases with high scores on the outcome, as was the case for propositions 3-6, since other configurations exist that can predict high scores for the same outcome (i.e., the upper left side in the plot).

Discussion, Implications and Future Work

The present work suggests that for the adoption of mobile game applications combinations of users' perceptions of price value and game content quality, their positive and negative emotions, the time they spend playing mobile games, and their gender, form configurations that explain high intention to download mobile games. Drawing from complexity theory and configuration theory, we build a conceptual model serving as the basis for identifying the aforementioned configurations. The findings identify ten configurations explaining high intention to download mobile games, and show how the same antecedents can be more or less important for different types of users.

The study highlights the importance of positive emotions, consistent with prior works (Kuo and Wu, 2012; Pappas et al., 2014; Pappas et al., 2017a), as they are present in 7 out of 10 solutions, always as a core condition. This suggests that users who feel happy and satisfied when playing mobile games, are like to disregard low perceptions on price value and game content (e.g., an expensive game with poor content) or even any negative emotions when it comes to download a mobile game. Furthermore, the findings confirm the importance of game content quality as well as that of price value, regarding mobile applications, as when they are high, intention to download with also be high for all types of users. This is an intuitive finding, as mobile games that offer content of a certain quality and in accordance with their price, are more likely to be downloaded. Similarly, it is interesting to point out that female heavy gamers with high perceptions of game content quality, will have high intention to download mobile games even when price value is low. This suggests that, gameplay time is linked with game content, and some users may be willing to pay a higher price for a mobile game, as they consider its content to be of high quality and they spend a lot of time during the day playing (e.g., playing while commuting).

Also, the findings show that for gamers who play on average over an hour per day, game content quality is more important than price value, as the former appears mainly as a core factor, while the latter is always a peripheral factor (either present or absent). Instead, for users that play less than an hour, price value is very important (i.e., core factor) when it is present, indicating that occasional gamers are more particular on how much money they spend on gaming, as opposed to heavy gamers who may pay more on game content, and might be willing to spend more money for a game of high quality. The findings suggest that male and female gamers have similar behavior regarding their emotions and gameplay time. Nonetheless, females may focus more on game content, which is present in more solutions, and less on price value, which is absent in more solutions. The latter points towards an interesting differentiation, where female gamers may seek high quality games even if they are not reasonably priced.

Theoretical and Methodological Implications

Prior research shows that consumers' perceived value is a complex construct that comprises multiple dimensions and plays a pivotal role in formulating users' behaviours in various contexts (Sweeney and Soutar, 2001; Zeithaml, 1988). Thus, to understand what drives consumers to make a specific choice and why they buy a product or service the Theory of Consumption Values (TCV) has been proposed (Sheth et al., 1991). In TCV not all the dimensions of perceived value are equally important and although they may relate with each other they are independent and a change in one will not lead to a similar change to another dimension (Sheth et al., 1991; Turel et al., 2010). Although this indicates to asymmetric relations among dimensions, most studies in the area build and extend TCV by assuming the existence of symmetric relations and employing variance-based approaches to examine consumers perceived value (Park and Lee, 2011; Turel et al., 2010). To address this limitation, we employ a different methodological approach that allows researchers to the asymmetry inherent in real-life phenomena. Methodology is critical, as it defines how we study a phenomenon and how we think about it (Bagozzi, 2007). The findings present the combinations of price value, game content quality, emotions, gender, and gameplay time can be sufficient or necessary to explain high intention to

download mobile game. Thus, this study contributes to the literature on consumer value by the identifying the asymmetric relations within its dimensions that explain users' intentions in the context of mobile gaming.

Next, following previous studies that employ TCV (Park and Lee, 2011; Turel et al., 2010), the findings suggest that the dimension of emotional value may be extended by including more dimensions of emotions, both positive and negative, considering their significant role in other contexts (Bagozzi et al., 2016; Pappas et al., 2017a), especially in the highly experiential and hedonic environment of mobile games. The findings show that positive emotions, a typically main antecedent of satisfaction (Oliver, 2014) as well as of users' intentions in online and mobile gaming (Liang and Yeh, 2011; Wu et al., 2018), is present as a core factor in 7 out of 10 solutions, which means that they are a necessary condition for these solutions. Also, the presence or absence of negative emotions is necessary in 7 out of 10 solutions, and in 4 solutions both types of emotions play a role together. We contribute to the literature by offering deeper insight on how emotions, a multidimensional factor, combine with users' perceived value to predict their intention to download mobile games, thus, aiding researchers to revisit models and theories on user behavior to better capture the complexity of online and mobile gaming. This can be achieved by extending traditional MRAs and SEM analyses with fsQCA, which when employed with complexity theory contributes to theory building (Fiss, 2011; Woodside, 2014), and can lead to the identification of new research questions based on the multiple solutions that explain the same outcome. To this end, here we test specific models, based on specific propositions, that allow us to identify how many male or female users, within the sample, with similar levels of perceived value, emotions, time playing mobile games, have different intention to download mobile games. The results show complex causal patterns among the predictor variables and highlight asymmetric relationships that lead to the same outcome, towards the development of new hypotheses and new models of consumer behavior.

The study complements extant research in the area of mobile gaming applications [e.g., (Hsiao and Chen, 2016; Liang and Yeh, 2011; Su et al., 2016)], by offering an alternative view on how users decide which game to download, and by showing how important antecedents of users' behavior can combine with each other to explain future intentions. In addition, by employing configurational analysis we include in our results part of the sample that cannot be identified by the traditional analyses of variance. Thus, we offer multiple solutions that cover a larger part of the sample and at the same time empirically validate the synergetic nature of price value, game content quality, positive and negative emotions, gender, and gameplay time as they combine to explain intention to download mobile games. The findings are consistent with recent studies that highlight the importance of price value and content quality on users' mobile gaming experience and behavioral intentions (Rezaei and Ghodsi, 2014; Zhou, 2013). Furthermore, we complement these studies by showing that price value and content quality can be necessary conditions for specific solutions, thus going beyond the discussion of importance and significance that stems from the identification of a single best solution. On the other hand, our findings contradict online and mobile gaming studies (Liu and Li, 2011; Rezaei and Ghodsi, 2014), that found no effect of emotions on behavioral intentions, although we expect users' to choose games because they like them, feel happy or have a positive experience. Nonetheless, the aforementioned studies take a net effects approach and do not examine how different combinations and interrelations of the same factors can better explain intentions. This study contributes by addressing this gap and providing deeper insight on the role of price value and game content quality, as well as details on how it combines with emotions to explain high intention to download a mobile game, for different types of gamers.

The most important contribution of this paper are its methodological implications, as it differs from previous studies in mobile gaming adoption that employ variance methods, such as regression and structural equation modelling, to examine users' intentions (Hsiao and Chen, 2016; Liu and Li, 2011). Different from the traditional hypotheses, here research propositions are formulated which can capture causal recipes taking a holistic approach of complex, interconnected systems and processes that should be studied together (El Sawy et al., 2010; Ragin, 2008). Thus, this study formulates research propositions and a configuration analysis is performed with the use of the data analysis tool fsQCA to examine the asymmetric relationships among the factors. This methodology has recently received increased attention in marketing and e-business studies (Pappas et al., 2016; Schmitt et al., 2017), and when applied together with complexity theory and configuration theory, is able to contribute towards the creation of new hypotheses and theories (Woodside, 2014). To this end, we propose a conceptual model to predict users' intention to download mobile games. An analysis of necessity is conducted to detect if any of the antecedent conditions is indispensable for

explaining intention to download mobile games. It is important to highlight such factors, as they can help in identifying what conditions should be met or avoided, for the presence or the absence of an outcome. The findings provide complex causal patterns among the predictor variables and highlight asymmetric relationships that may lead to the same outcome, and the results lead to the development of new hypotheses to be examined.

Practical and Managerial Implications

This study offers specific paths leading to high intention to download mobile games, which may be used by practitioners to improve their games and the ways they communicate with their users. As video game industry has grown considerably generating value for both the industry and the gamer (Marchand and Hennig-Thurau, 2013), game developers should take into consideration users' characteristics based on their gameplay time, choose to target specific types of gamers, and highlight different aspects each time. The findings show that game content quality, price value, and positive emotions, are essential for all types of users. For existing and well-established companies it is likely that they have exhausted the possibilities to make such holistic improvements, nonetheless, there is still room for improvement, since for example in United States of America application usage makes up for 52% of the total digital media engagement (Lella and Lipsman, 2014). Indeed, to increase users' engagement personalization techniques should be employed (Zhou, 2013). And since information about user's preferences based on their usage history can be easily collected, our findings can guide companies on how to communicate with different types of gamers. For example, promote the quality of the content when addressing heavy users, or the price when addressing users who do not play a lot during the day. The former may be willing to spend more money if the game offers high content quality, while the latter prefer to spend less as they do not intend to take full advantage of all the available game content. Such an approach can be successful by employing freemium pricing strategies, on which the main content is offered free of charge, but the user has to pay to receive more and better content. By extension, developers may choose different communication channels, based on the gamers' gender or how much time they spend within the game. For instance, in might be an effective strategy if in-game advertisements focus on heavy gamers since they spend more time playing, or target female heavy users as they are willing to overspend if the content is of high quality, compared to male heavy users

Developers should constantly interact with their users, through various channels, to capture their preferences, and emotions, in order to design challenging and interesting games (Liu and Li, 2011). Indeed, the companies that create and sell mobile games should employ designs and strategies, to better address user needs, evoke positive emotions, and mitigate the formulation of negative emotions. Also, since the presence or absence of price value is a necessary condition for 8 solutions, developers may take into account specific characteristics of their games that can influence either positively or negatively in-game prices (Hsiao and Chen, 2016; Xu et al., 2017). A variety of information technology tools can be used to capture perceptions regarding content quality, price value, and emotions, such as text mining of user reviews and feedback (Ganu et al., 2013) and developing collaborative filtering or pattern analysis of user ratings and comments (Choi et al., 2012). Various channels exist on which developers can employ such techniques, such as within the stores that sell the mobile games (e.g., Apple's App Store) or on multiple technology and gaming forums. Mobile games need to have engaging topics and plots, to avoid making the users feel bored after playing the game for a while. Combining such knowledge, with users' gameplay time, which the developers already know, can help them improve not just their games but also their communication strategies.

Limitations and Suggestions for Future Work

This study has some limitations. First, we used a non-random sampling, thus the generalization of the findings should be done with caution. Nonetheless, we used a snowballing approach to contact experienced users with mobile gaming. We also controlled for mobile gaming experience, and all respondents were removed from the analysis. Next, we did not control for the use context (e.g., playing while commuting), which has been found to be important in mobile game adoption (Liu and Li, 2011). The findings are based on self-reported data. For an interdependent approach, future studies may combine self-reported data with archival data from mobile game providers, and extend them with semi-structured interviews, and observations, as well as data from actual downloads, which may provide deeper insight on user behavior. The vast number of data generated when we use mobile games and applications could also play an

important role in the value of digital transformations that emerges in big data analytics ecosystems (Pappas et al., 2018).

Next, based on the different solutions for male and female gamers, qualitative approaches including netnography may be employed as they have been shown to offer useful insight in female online games (Wang et al., 2017). Furthermore, we do not examine social factors, social interactions, or motivations to download a game, however future studies should take them into account, as contradicting results exist on how they influence intentions, offering deeper insights in explaining user behavior (Rezaei and Ghodsi, 2014; Zhou, 2013). To this end, considering the relation of mobile games with social media future studies may examine how users decide to share electronic word-of-mouth promotional messages in their networks, based on tie strength or concreteness of the message (Choi et al., 2017).

Future studies may also examine value co-creation in mobile gaming applications, as consumers and companies have been collaborating at different levels to improve their games or services. Especially, with the evolution of mobile phones and applications, as well as social networks, value co-creation can lead to better services and products in the broader “gaming” market, that includes more than just the games (Harwood and Garry, 2010; Roberts et al., 2014). Employing fsQCA to examine value co-creation (Pappas et al., 2017b), can help in better understanding the complexity and multidimensionality of value co-creation in service ecosystems (Akaka et al., 2014; Vargo et al., 2008; Zhang et al., 2017) by capturing the interrelations among the different actors who aim to create value together.

This paper differs from previous studies in the area that focus on net effects among variables, adopts complexity theory and employs configurational analysis to better explain intention to download mobile games. This study is among the first to employ fsQCA in mobile application adoption, to advance the field by better understanding the gamer through a novel approach. Future studies should take a similar approach to verify our findings, and to extend theory in different contexts. Furthermore, future studies may set research boundaries by putting specific focus in terms of types of mobile games or specific user segments. It should be noted that fsQCA does not identify the unique contribution of every variable for every solution, instead it identifies complex combinations of variables and the amount of the outcome that is explained by these combinations

REFERENCES

- Akaka, M. A., Corsaro, D., Kelleher, C., Maglio, P. P., Seo, Y., Lusch, R. F. and Vargo, S. L. (2014) “The role of symbols in value cocreation”, *Marketing Theory*, Vol. 14 No. 3, pp. 311-326.
- Bagozzi, R. P. (2007) “The legacy of the technology acceptance model and a proposal for a paradigm shift”, *Journal of the association for information systems*, Vol. 8 No. 4, pp. 3.
- Bagozzi, R. P., Belanche, D., Casaló, L. V. and Flavián, C. (2016) “The Role of Anticipated Emotions in Purchase Intentions”, *Psychology & Marketing*, Vol. 33 No. 8, pp. 629-645.
- Barclay, L. J. and Kiefer, T. (2014) “Approach or avoid? Exploring overall justice and the differential effects of positive and negative emotions”, *Journal of Management*, Vol. 40 No. 7, pp. 1857-1898.
- Chang, T.-S., Ku, C.-Y. and Fu, H.-P. (2013) “Grey theory analysis of online population and online game industry revenue in Taiwan”, *Technological Forecasting and Social Change*, Vol. 80 No. 1, pp. 175-185.
- Choi, K., Yoo, D., Kim, G. and Suh, Y. (2012) “A hybrid online-product recommendation system: Combining implicit rating-based collaborative filtering and sequential pattern analysis”, *Electronic Commerce Research and Applications*, Vol. 11 No. 4, pp. 309-317.
- Choi, Y. K., Seo, Y. and Yoon, S. (2017) “E-WOM messaging on social media: social ties, temporal distance, and message concreteness”, *Internet Research*, Vol. 27 No. 3, pp. 495-505.
- Davis, R. and Lang, B. (2012) “Modeling game usage, purchase behavior and ease of use”, *Entertainment Computing*, Vol. 3 No. 2, pp. 27-36.
- Demetrovics, Z., Urbán, R., Nagygyörgy, K., Farkas, J., Zilahy, D., Mervó, B., Reindl, A., Ágoston, C., Kertész, A. and Harmath, E. (2011) “Why do you play? The development of the motives for online gaming questionnaire (MOGQ)”, *Behavior research methods*, Vol. 43 No. 3, pp. 814-825.
- Dul, J. (2016) “Identifying single necessary conditions with NCA and fsQCA”, *Journal of Business Research*, Vol. 69 No. 4, pp. 1516-1523.
- El Sawy, O. A., Malhotra, A., Park, Y. and Pavlou, P. A. (2010) “Research Commentary-Seeking the Configurations of Digital Ecodynamics: It Takes Three to Tango”, *Information Systems Research*, Vol. 21 No. 4, pp. 835-848.

- Fiss, P. C. (2007) "A set-theoretic approach to organizational configurations", *Academy of management review*, Vol. 32 No. 4, pp. 1180-1198.
- Fiss, P. C. (2011) "Building better causal theories: A fuzzy set approach to typologies in organization research", *Academy of Management Journal*, Vol. 54 No. 2, pp. 393-420.
- Fornell, C. and Larcker, D. F. (1981) "Structural equation models with unobservable variables and measurement error: Algebra and statistics", *Journal of marketing research*, Vol. 18 No. 3, pp. 382-388.
- Ganu, G., Kakodkar, Y. and Marian, A. (2013) "Improving the quality of predictions using textual information in online user reviews", *Information Systems*, Vol. 38 No. 1, pp. 1-15.
- Ha, I., Yoon, Y. and Choi, M. (2007) "Determinants of adoption of mobile games under mobile broadband wireless access environment", *Information & management*, Vol. 44 No. 3, pp. 276-286.
- Harwood, T. and Garry, T. (2010) "'It's Mine!'—Participation and ownership within virtual co-creation environments", *Journal of Marketing Management*, Vol. 26 No. 3-4, pp. 290-301.
- Hsiao, K.-L. and Chen, C.-C. (2016) "What drives in-app purchase intention for mobile games? An examination of perceived values and loyalty", *Electronic Commerce Research and Applications*, Vol. 16 No., pp. 18-29.
- Huang, L.-Y. and Hsieh, Y.-J. (2011) "Predicting online game loyalty based on need gratification and experiential motives", *Internet Research*, Vol. 21 No. 5, pp. 581-598.
- Koo, D.-M. and Ju, S.-H. (2010) "The interactional effects of atmospherics and perceptual curiosity on emotions and online shopping intention", *Computers in Human Behavior*, Vol. 26 No. 3, pp. 377-388.
- Kuo, Y.-F. and Wu, C.-M. (2012) "Satisfaction and post-purchase intentions with service recovery of online shopping websites: Perspectives on perceived justice and emotions", *International Journal of Information Management*, Vol. 32 No. 2, pp. 127-138.
- Leischnig, A. and Kasper-Brauer, K. (2015) "Employee adaptive behavior in service enactments", *Journal of Business Research*, Vol. 68 No. 2, pp. 273-280.
- Lella, A. and Lipsman, A. (2014) "The US mobile app report", *Tech. Rep.*, Vol. 8 No.
- Leong, L.-Y., Ooi, K.-B., Chong, A. Y.-L. and Lin, B. (2013) "Modeling the stimulators of the behavioral intention to use mobile entertainment: Does gender really matter?", *Computers in Human Behavior*, Vol. 29 No. 5, pp. 2109-2121.
- Liang, T.-P. and Yeh, Y.-H. (2011) "Effect of use contexts on the continuous use of mobile services: the case of mobile games", *Personal and Ubiquitous Computing*, Vol. 15 No. 2, pp. 187-196.
- Liu, D. and Guo, X. (2017) "Exploring gender differences in acceptance of mobile computing devices among college students", *Information Systems and e-Business Management*, Vol. 15 No. 1, pp. 197-223.
- Liu, F., Zhao, X., Chau, P. Y. and Tang, Q. (2015) "Roles of perceived value and individual differences in the acceptance of mobile coupon applications", *Internet Research*, Vol. 25 No. 3, pp. 471-495.
- Liu, Y. and Li, H. (2011) "Exploring the impact of use context on mobile hedonic services adoption: An empirical study on mobile gaming in China", *Computers in Human Behavior*, Vol. 27 No. 2, pp. 890-898.
- Liu, Y., Mezei, J., Kostakos, V. and Li, H. (2017) "Applying configurational analysis to IS behavioural research: a methodological alternative for modelling combinatorial complexities", *Information Systems Journal*, Vol. 27 No. 1, pp. 59-89.
- Marchand, A. and Hennig-Thurau, T. (2013) "Value creation in the video game industry: Industry economics, consumer benefits, and research opportunities", *Journal of Interactive Marketing*, Vol. 27 No. 3, pp. 141-157.
- Neys, J. L., Jansz, J. and Tan, E. S. (2014) "Exploring persistence in gaming: The role of self-determination and social identity", *Computers in Human Behavior*, Vol. 37 No., pp. 196-209.
- O'Brien, R. M. (2007) "A caution regarding rules of thumb for variance inflation factors", *Quality & Quantity*, Vol. 41 No. 5, pp. 673-690.
- Oliver, R. L. (2014) *Satisfaction: A behavioral perspective on the consumer*. Routledge.
- Ordanini, A., Parasuraman, A. and Rubera, G. (2014) "When the recipe is more important than the ingredients a Qualitative Comparative Analysis (QCA) of service innovation configurations", *Journal of Service Research*, Vol. 17 No. 2, pp. 134-149.
- Pappas, I. O. (2018) "User experience in personalized online shopping: a fuzzy-set analysis", *European Journal of Marketing*, Vol. 52 No. 7/8, pp. 1679-1703.
- Pappas, I.O., Giannakos, M.N. and Sampson, D.G. (2019), "Fuzzy set analysis as a means to understand users of 21st-century learning systems: the case of mobile learning and reflections on learning analytics research", *Computers in Human Behavior*, Vol.92, pp. 646-659. doi: 10.1016/j.chb.2017.10.010
- Pappas, I. O., Kourouthanassis, P. E., Giannakos, M. N. and Chrissikopoulos, V. (2014) "Shiny happy people buying: the role of emotions on personalized e-shopping", *Electronic Markets*, Vol. 24 No. 3, pp. 193-206.

- Pappas, I. O., Kourouthanassis, P. E., Giannakos, M. N. and Chrissikopoulos, V. (2016) "Explaining online shopping behavior with fsQCA: The role of cognitive and affective perceptions", *Journal of Business Research*, Vol. 69 No. 2, pp. 794-803.
- Pappas, I. O., Kourouthanassis, P. E., Giannakos, M. N. and Chrissikopoulos, V. (2017a) "Sense and sensibility in personalized e-commerce: How emotions rebalance the purchase intentions of persuaded customers", *Psychology & Marketing*, Vol. 34 No. 10, pp. 972-986.
- Pappas, I. O., Mikalef, P., Giannakos, M. N., Krogstie, J. and Lekakos, G. (2018) "Big data and business analytics ecosystems: paving the way towards digital transformation and sustainable societies", *Information Systems and e-Business Management*. 10.1007/s10257-018-0377-z
- Pappas, I. O., Mikalef, P., Giannakos, M. N. and Pavlou, P. A. 'Value co-creation and trust in social commerce: An fsQCA approach', *25th European Conference on Information Systems (ECIS)*, Guimarães, Portugal.
- Park, B.-W. and Lee, K. C. (2011) "An empirical analysis of online gamers' perceptions of game items: Modified theory of consumption values approach", *Cyberpsychology, Behavior, and Social Networking*, Vol. 14 No. 7-8, pp. 453-459.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y. and Podsakoff, N. P. (2003) "Common method biases in behavioral research: a critical review of the literature and recommended remedies", *Journal of applied psychology*, Vol. 88 No. 5, pp. 879.
- Ragin, C. C. (2006) "Set relations in social research: Evaluating their consistency and coverage", *Political Analysis*, Vol. 14 No. 3, pp. 291-310.
- Ragin, C. C. (2008) *Redesigning social inquiry: Fuzzy sets and beyond*. Wiley Online Library.
- Rezaei, S. and Ghodsi, S. S. (2014) "Does value matters in playing online game? An empirical study among massively multiplayer online role-playing games (MMORPGs)", *Computers in Human Behavior*, Vol. 35 No., pp. 252-266.
- Roberts, D., Hughes, M. and Kertbo, K. (2014) "Exploring consumers' motivations to engage in innovation through co-creation activities", *European Journal of Marketing*, Vol. 48 No. 1/2, pp. 147-169.
- Schmitt, A. K., Grawe, A. and Woodside, A. G. (2017) "Illustrating the power of fsQCA in explaining paradoxical consumer environmental orientations", *Psychology & Marketing*, Vol. 34 No. 3, pp. 323-334.
- Schneider, C. Q. and Wagemann, C. (2010) "Standards of good practice in qualitative comparative analysis (QCA) and fuzzy-sets", *Comparative Sociology*, Vol. 9 No. 3, pp. 397-418.
- SensorTower (2017a) "*Store Intelligence. Q4 2016 Data Digest*": Sensor Tower. Available at: <https://s3.amazonaws.com/sensortower-itunes/Quarterly+Reports/Sensor-Tower-Q4-2016-Data-Digest.pdf?src=blog>.
- SensorTower (2017b) "*U.S. iPhone Users Spent An Average of \$40 on Apps in 2016*". Available at: <https://sensortower.com/blog/revenue-per-iphone-2016>.
- Seo, Y., Buchanan-Oliver, M. and Fam, K. S. (2015) "Advancing research on computer game consumption: A future research agenda", *Journal of Consumer Behaviour*, Vol. 14 No. 6, pp. 353-356.
- Sheth, J. N., Newman, B. I. and Gross, B. L. (1991) "Why we buy what we buy: A theory of consumption values", *Journal of business research*, Vol. 22 No. 2, pp. 159-170.
- Son, J. (2017) "The impact of initial experience and user attachment on application downloads: Information-seeking and-sharing applications", *Internet Research*, Vol. 27 No. 2, pp. 256-276.
- Su, Y.-S., Chiang, W.-L., Lee, C.-T. J. and Chang, H.-C. (2016) "The effect of flow experience on player loyalty in mobile game application", *Computers in Human Behavior*, Vol. 63 No., pp. 240-248.
- Sutanto, J., Palme, E., Tan, C.-H. and Phang, C. W. (2013) "Addressing the Personalization-Privacy Paradox: An Empirical Assessment from a Field Experiment on Smartphone Users", *Mis Quarterly*, Vol. 37 No. 4, pp. 1141-1164.
- Sweeney, J. C. and Soutar, G. N. (2001) "Consumer perceived value: The development of a multiple item scale", *Journal of retailing*, Vol. 77 No. 2, pp. 203-220.
- Turel, O., Serenko, A. and Bontis, N. (2010) "User acceptance of hedonic digital artifacts: A theory of consumption values perspective", *Information & Management*, Vol. 47 No. 1, pp. 53-59.
- Vargo, S. L., Maglio, P. P. and Akaka, M. A. (2008) "On value and value co-creation: A service systems and service logic perspective", *European management journal*, Vol. 26 No. 3, pp. 145-152.
- Venkatesh, V., Thong, J. Y. and Xu, X. (2012) "Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology", *MIS quarterly*, Vol. 36 No. 1, pp. 157-178.
- Wang, Y.-S., Lee, W.-L. and Hsu, T.-H. (2017) "Using netnography for the study of role-playing in female online games: Interpretation of situational context model", *Internet Research*, Vol. 27 No. 4, pp. 905-923.
- Wei, P.-S. and Lu, H.-P. (2014) "Why do people play mobile social games? An examination of network externalities and of uses and gratifications", *Internet Research*, Vol. 24 No. 3, pp. 313-331.

- Woodside, A. G. (2013) "Moving beyond multiple regression analysis to algorithms: Calling for adoption of a paradigm shift from symmetric to asymmetric thinking in data analysis and crafting theory", *Journal of Business Research*, Vol. 66 No. 4, pp. 463-472.
- Woodside, A. G. (2014) "Embrace• perform• model: Complexity theory, contrarian case analysis, and multiple realities", *Journal of Business Research*, Vol. 67 No. 12, pp. 2495-2503.
- Woodside, A. G. (2017) *The complexity turn: Cultural, management, and marketing applications*. Berlin: Springer.
- Wu, Y., Cui, T., Liu, N., Deng, Y. and Guo, J. (2018) "Demystifying continuous participation in game applications at social networking sites: A social playfulness design perspective", *Internet Research*, Vol. 28 No. 2, pp. 374-392.
- Xu, X., Yang, X., Lu, J., Lan, J., Peng, T.-Q., Wu, Y. and Chen, W. (2017) "Examining the effects of network externalities, density, and closure on in-game currency price in online games", *Internet Research*, Vol. 27 No. 4, pp. 924-941.
- Zeithaml, V. A. (1988) "Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence", *The Journal of marketing*, Vol. No., pp. 2-22.
- Zhang, M., Hu, M., Guo, L. and Liu, W. (2017) "Understanding relationships among customer experience, engagement, and word-of-mouth intention on online brand communities: The perspective of service ecosystem", *Internet Research*, Vol. 27 No. 4, pp. 839-857.
- Zhao, L., Lu, Y., Zhang, L. and Chau, P. Y. (2012) "Assessing the effects of service quality and justice on customer satisfaction and the continuance intention of mobile value-added services: An empirical test of a multidimensional model", *Decision support systems*, Vol. 52 No. 3, pp. 645-656.
- Zhou, T. (2013) "Understanding the effect of flow on user adoption of mobile games", *Personal and ubiquitous computing*, Vol. 17 No. 4, pp. 741-748.

Appendix

Construct and scale items	Mean	S.D.	Loading
Price value, Cronbach alpha = .88			
<i>Users' perceptions that mobile games are reasonably priced and have a good value for money (Rezaei & Ghodsi, 2014)</i>			
Mobile games are reasonably priced	4.10	1.63	0.86
Mobile games offer value for money	3.99	1.57	0.93
Mobile games are good product for the price	4.11	1.45	0.91
Game Content Quality, Cronbach alpha = .81			
<i>Users' perception towards attractiveness, timeliness and personalization of mobile game content (Zhou, 2013)</i>			
Mobile games provide up to date contents	4.66	1.58	0.83
Mobile games provide attractive content	4.76	1.38	0.87
Mobile games provide content pertaining to my needs	4.49	1.46	0.85
Positive Emotions, Cronbach alpha = .91			
<i>The level that users feel happy, satisfied or valued when playing mobile games. (Pappas et al., 2014)</i>			
I feel happy when I play mobile games	5.06	1.59	0.94
I feel satisfied when I play mobile games	4.88	1.57	0.94
I feel valued when I play mobile games	4.39	1.64	0.83
Negative emotions, Cronbach alpha = .94			
<i>The level that users feel angry, in a bad mood, or upset when playing mobile games. (Pappas et al., 2014)</i>			
I feel angry when I play mobile games	2.77	1.74	0.90
I feel in a bad mood when I play mobile games	2.59	1.74	0.93
I feel upset when I play mobile games	2.44	1.73	0.93
Intention to download, Cronbach alpha = .90			
<i>Users' intention to download mobile games in the future. (Pappas et al., 2014)</i>			
In the future, I intend to continue downloading mobile games.	5.12	1.63	0.89
My general intention to download mobile games very high.	4.68	1.64	0.89
I will download mobile games in the future.	4.85	1.60	0.81
I will think to download mobile games.	5.18	1.63	0.90

Appendix. Construct definition, scale items with mean, standard deviation, and standardized loading