A Factor-Based Exploration of Player´s Continuation Desire in Free-to-Play Mobile Games

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Abstract

This paper explores the concept of Continuation Desire further by investigating the behavioral intent of players' desire to keep playing. User experience is a complex, multifaceted topic, which is commonly studied through different aspects namely engagement, continuation desire, immersion, flow experience, motivation and enjoyment - yet it is difficult to measure. These concepts were conceptualized into different factors and thereby it was identified which of them are related. This resulted in a synthesized model that was based on the Theory of Planned Behavior model. This model takes into account the perceived user experience factors relevant for Continuation Desire and then attempts to predict players' intention to continue playing. Structural Equation Modeling analysis was performed to validate the model and to predict the intention of continuation desire. At the same time, exploring why people continue playing, based on experiments using Candy Crush Saga, one of the most popular Free-to-Play mobile games worldwide. The findings indicate that motivation is an important factor of Continuation Desire in Free-to-Play mobile games, with engagement, enjoyment and flow being less important. This paper contributes an early work of a factor-based exploration of measuring user experience and their continuation desire.

Introduction and Motivation

User experience in games is an inherently complex construct which is challenging to measure in its entirety in practice, and therefore often interpreted or defined through different aspects or factors such as fun, affect, engagement, (Cowley et al. 2008) flow (Weibel et al. 2008), or enjoyment (Klimmt, Vorderer, and Ritterfeld, 2004). These concepts are used to either measure components of the user experience in games, or as proxy measures of the user experience. Regardless, user experience is complicated to measure, even with psychophysiological methods, (Drachen et al. 2010).

The Free-to-Play (F2P) mobile market today forms a major component of the digital games market worldwide (TIGA, 2013), and mobile devices currently form the most used gaming platform (Populus, 2014). Within F2P mobile games, *continuation desire* (Schoenau-Fog, 2011, 2014) is one of the most desirable components of user experience to understand in the specific context of F2P mobile games, because these games live or die financially based on their ability to keep players engaged (Luton, 2013) (Fields and Cotton, 2014). The F2P sector of the games industry has a comparatively strong history of employing telemetry-based experiments such as split-level testing and behavioral analytics in general (Seif El-Nasr, Drachen, and Cannossa, 2013), such methods generally only permits inference of user experience-related issues (i.e. using e.g. progress in the game as indicator of user experience). In essence, behavioral telemetry (Tychsen, 2008) - does not consistently offer deep insights into the root causes of player behavior. Thus, this paper's motivation is to explore deeper roots of continuation desire in F2P mobile games.

In this paper the concept of Continuation Desire is explored in the specific context of F2P mobile games, using Candy Crush Saga as the case. Candy Crush Saga is a match-three puzzle game released by King in April 2012 for Facebook, and later the same year for mobile devices. It is one of the world´s most played F2P games with over 100 million download. Potential motivators for Continuation Desire identified in previous work on user experience in games, such as engagement, motivation, flow experience and enjoyment, were synthesized into a model based on the Theory of Planned Behavior (Ajzen, 1991). Following an experiment with (n=31) participants, Structural Equation Modeling was performed to evaluate the model and potential predictors for Continuation Desire. The results indicate that various types of motivation impact directly on Continuation Desire, with "real-time" components of the user experience – engagement, enjoyment and flow – being less important. The paper contributes an early version of a

factor model that can be used in understanding deeper roots of player behavior.

Related Work

User experience in games is a broad topic that has been widely explored, and a thorough review of the factors used here is not possible due to space restrictions. This section will therefore concentrate on key related work.

Social psychology research suggests that finding behavioral intention to use a system is specifically good for predicting the future behavior of people using that system (Ajzen and Fishbein, 1975). The Theory of Planned Behavior (TPB) model has a strong history of being applied in a variety of contexts towards studying behavioral intention, e.g.: (Mathieson, 1991) (Ajzen, 1991) (Lee M.-C., 2009). The TPB model basically consists of four dimensions: - *behavioral control*, *subjective norm* and *attitude towards the behavior*; which are connected to the *intention* aspect.

Perceived behavioral control stands for how people perceive the ease or difficulty to behave according to their interests. **Subjective norm** is a social factor, identified as perceived social pressure for performing the behavior. **Attitude towards the behavior** represents the degree to which person´s evaluated behavior is favorable or unfavorable. These aspects correlate with intention. The strength of the correlation allows for generating assumptions about predicting the behavior of users using a specific system (Ajzen, 1991). The TPB model is often used in a situation where comparison is needed, e.g. showing how one system is superior to another in fostering intention to continue using that system. In the context of games, it is here assumed that intention can similarly be represented via the three components specified by TPB theory. This assumption is supported by the fact that digital games can be viewed as information systems. Also, TPB has been applied to digital games in the past: as certain games could be seen as a system that is used rather than other. When games became more popular some studies tried to investigate the use of a game by extending the TPB model with concepts such as flow experience, enjoyment (Lee M.-C., 2009) (Chang and Chin, 2011) (Park et al. 2013), motivation (Lee, Lee, and Choi, 2012). Their work showed that these concepts are in fact influential on the TPB model, specifically attitude and intention. This suggests that the approach of TPB model as a basis assumption to predict the behavior and extending it with aspects of user experience could potentially be valid to keep players continue and understand why they keep playing. Although, this paper would differentiate from the other work by trying to identify how to keep players playing a certain mobile game, rather than to play one game compared to the other.

Flow theory is used as a mean to explain user engagement and their experiences. In this context, it is used as a term that defines activities that have a balancing match between challenges and skills (Csikszentmihalyi, 1990). Presence and enjoyment is highly correlated when working with flow experience but they should be considered as being separate factors (Weibel et al. 2008). This is because flow is the mediator of both factors. Also, the study describes that presence is mostly experienced in 3D virtual environments. However, mobile games such as Candy Crush Saga do not have such design. There are a variety of constructs of flow that can measure it (Csikszentmihalyi, 1990) (Li and Browne, 2006), though the focus will be on *goals, attention focus of users* and *a sense of loss of time*. They are the most relevant in the context of the playing session towards understanding behavioral intention of players.

Enjoyment is also identified as the core element of entertainment in media (Klimmt, Vorderer, and Ritterfeld, 2004). It was also found to be essential on intention of using online and mobile games (Chang and Chin, 2011) (Lee M.-C. , 2009).

Engagement is a multifaceted concept, which has been studied through flow experience (Wiebe et al. 2013), motivation (Lee, Lee, and Choi, 2012), continuation desire (Schoenau-Fog, 2011, 2014), immersion (Brown and Cairns, 2004). One way of understanding it is when one is engaged or involved to a certain task. This is a part of immersion first level of involvement; it can be reached through four barriers: *invested time*, *effort, have interest* and *being willing to concentrate* (Brown and Cairns, 2004). The connection between motivation and engagement is that the combination of two causes user to re-asses game challenges and his skills in order to play again (Wiebe et al. 2013). This partly works with flow experience, since one may experience flow state when his skills matches the challenges. Also, flow is related to user's familiarity of objects, narrative, or structure of the game which through that same motivation and engagement causes to re-engage to play (Sharek, 2012).

A study (Lee, Lee, and Choi, 2012) has identified six motivational determinants to play mobile games: *social interaction, self-presentation, fantasy/role playing, passing time/escapism, entertainment, and challenge/competition*. The players motivations show why they begin playing and in combination with engagement why they continue to play.

The desire that keep the player want to continue play and the desire that makes the player come back to play the game repeatedly, could be understood as the intention of the player. Studies showed that the costumer that wants to play a game repeatedly has a high level of customer loyalty. This loyalty is influenced by *personal* and *social interaction* and *flow* (Choi and Kim, 2004). They are similar to

the four dimensions that are used to measure continuation desire (CD), namely *objectives*, *activities*, *accomplishments* and *affect* (Schoenau-Fog, 2011, 2014). The continuation desire concept - like engagement - also have multiple facets, though most of them are within engagement, meaning that some of the facets of engagement could be correlated to continuation desire.

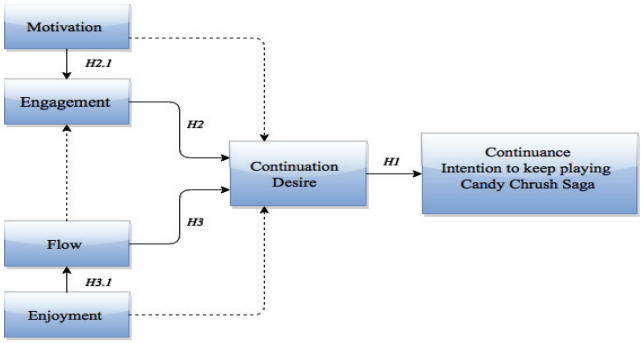
It is popular to distinguish gamers between hardcore and casual, although, the definitions vary and are somewhat nebulous. Some studies and game companies explain them through the amount of time spent, different type of games they play and style of play (Jacobs and Ip, 2005) (Bateman and Boon, 2006) (Hobo, 2004). In 2014 EEDAR published a macro trending data on mobile games that splits players into three groups of how much money they spend – non-payers, moderate and heavy payers (Zatkin, 2014). These heavy payers were found to be only 5% of the players and they bring 49% of the revenue. Other reports (SWRVE, 2015) showed similar results where only 0.15% of payers bring 50% of the revenue. Those who spend more money typically fall under the category of hardcore players (Kamba, 2011) while the rest of them – casual players. Game companies try to keep players playing for longer periods of time, which in turn would make them become hardcore and moderate or heavy payers.

Factor Model

Based on the related work section and the theory of planned behavior a factor model was synthesized (Figure 1). The model consists of five constructs:

- **Continuation desire (CD)** – player desire to continue playing or come back to play repeatedly. The engagement to the game as a level of continuation desire can be measured through these components: objectives, activities, accomplishments and affect (Schoenau-Fog, 2011, 2014)
- **Engagement (EG)** – first level of immersion as involvement to the game or engagement to it. Player experiences engagement when he has invested time, effort and had interest in the game (Brown and Cairns, 2004)
- **Motivation (MV)** – is the driver to begin playing but can also be the driver to re-engage to play. Motivation can be extrinsic or intrinsic and can have various factors. In the chosen game the most relevant motivational factors seem to be: goals, pass-time, and entertainment. (Lee, Lee, and Choi, 2012)
- **Flow experience (FE)** – is the flow state that one experiences when his skills matches the challenges of the game. The most relevant measuring components of flow experience seem to be: goals, attention focus, and sense of loss of time (Csikszentmihalyi, 1990)
- **Enjoyment (EJ)** – the overall experience of enjoyment as an entertainment of the game or particular activity. Can be either positive or negative, while it is also possible to quantify the amount of enjoyment (Chang and Chin, 2011)

This model is similar to the TPB model. This is because continuation desire is looked as the intention, motivation as



the attitude towards the behavior and behavioral control as the flow experience. However, subjective norm is not present as the Candy Crush Saga has minimalistic social factor or self-presentation. Instead, the factor model is extended with intrinsic enjoyment and engagement to the game as they are important factors of user experience.

Figure 1: Factor Model; Black lined arrows describe hypothesized correlation among factors to continuation desire and the intention

The connections (Figure 1) in the model emphasize the assumption that the constructs correlate in that manner. Motivation is expected to contribute to begin playing and get engaged to it, as well as re-engage to it. Enjoyment is an important factor of experiencing flow, as well as the overall entertainment of the playing session. Flow contributes to the loyalty of the game and the desire to continue playing. Engagement can be understood as a level of continuation desire, therefore it is expected that there is correlation between them. The dotted arrows represent that constructs may inadvertently be connected to the other constructs, such as enjoyment may also be relevant for continuation desire.

Thus, through the strength of the intention to continue playing an indication of their actual continuance play can be predicted. Meaning that depending on how strong the correlation is between the intention and other factors, based on the TPB model research (Ajzen, 1991), behavior can be predicted. This is because perceived intention to use a system suggests that in fact user will use that system. In this case continuation desire is the perceived intention and the aim is to find out whether players in fact will continue playing.

The hypotheses are derived from the factor model as the main ideas to be tested.

- **H1**: Continuation desire has a positive effect for the players to continue playing

- **H2**: Perceived engagement to the game has a positive effect on perceived continuation desire
- **H2.1**: Perceived motivation towards the game has a positive effect on perceived engagement towards the game
- **H3**: Perceived flow experience has a positive effect on perceived continuation desire
- **H3.1**: Perceived enjoyment has a positive effect on perceived flow experience

Methods

To evaluate the model and understand why people keep playing a Structural Equation Modeling (SEM) method is used. This method is typically used in similar context, specifically with factor models and it is an advanced analysis method that excludes measurement error. It is a two-step process, first being reliability and validity model measurement and second being the model fit and hypotheses test (Anderson and Gerbing, 1988).

To gather data, the Game Experience Questionnaire (GEQ) was followed, which is one of a few empirically tested questionnaires for UX measurement in games. It measures 7 components of UX (Norman, 2013). It consists of different modules - in-game, post-game, social presence and core game experience. The most suitable module for the current project is the in-game module (iGEQ), given its condensed length. The same ranking scale was chosen for the questionnaires, as it can be consistently used for gaming experience. It is a 5 item scale ranging from 0 to 4, respectively meaning 'not at all', 'slightly', 'moderately', 'fairly' and 'extremely'. This basic tool is chosen because the factor model is based on the TPB model and that model is tested through Likert scale gathered data of answered questions/statements.

The test setup consists of randomly sampled casual players that were familiar with Candy Crush Saga app game *(n=31)*. The participants played for 10 minutes (covering on average the 8 first levels) and then completed a questionnaire. The questionnaire consists of 5 demographical and 15 user's perceived experiences within the play session questions (iGEQ). The 10 minutes of play is chosen due to casual players playing in short-bursts ranging from 0 to 30 minutes (Kamba, 2011) and analyzed King data metrics.

All participants were from Copenhagen, 17 male and 14 female, the dominant age bracket (80%) was between ranges 23-29. 64% of the participants had previously played the game but stopped, while the remainder were regular players. Their typical play sessions were mostly '15 min or less' (32%) and '16-30 min' (48%). None had made an in-app purchase.

To test the internal reliability of the constructs within the questionnaire Cronbach's alpha was used. This is because Cronbach's alpha is an estimated bound of consistency within the constructs. The suggested acceptable values range from 0.7 to 0.95 (Tavakol and Dennick, 2011) depending on the context of the work being performed and the field of research. To make sense of those values that do not reach the suggested cut-off value, item-total correlation are used to examine inter-item correlations and eliminate/relocate/evaluate items with low correlation coefficients (Tavakol and Dennick, 2011).

To test the validity of the constructs convergent and discriminant validity will be used (Said, Badru, and Shahid, 2011). Both tests are necessary to be shown in order to know if the constructs are valid and reliable. The first, test whether the constructs that are related are in fact related. It can be measured through factor loading, construct reliability and average variance extracted. Respectively, the suggested values as the lower bound are 0.5 (Said, Badru, and Shahid, 2011), 0.6 (Tseng, Dornyei, and Schmitt, 2006), 0.5 (Fornell and Larcker, 1981). The second, test whether the constructs that are not related are in fact not related. The discriminant validity is suggested to be valid when it is greater than squared correlations between constructs (Fornell and Larcker, 1981).

To find how good the measurement model fits to estimated models Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA) and its associated confidence interval of 90%, ratio of Chi-Square to the Degrees of Freedom (X^2/d. f), Standardized Root Mean Square Residual (SRMR) will be used as they are suggested to be the most commonly used (Hooper, Coughlan, and Mullen, 2008).

Results

The descriptive analysis, internal reliability and construct validity were calculated in Matlab R2014b. The SEM analysis was calculated with an online tool WebSEM.

Constructs	Mean	Standard deviation
Continuation Desire	2.1032	0.9407
Engagement	1.8280	1.1018
Motivation	2.2366	0.9591
Flow Experience	2.1935	1.0356
Enjoyment	2.4355	0.9810

Table 1: Descriptive Analysis of gathered data

The first measurements (Table 1) are just overall analysis of the data. Mean values suggest that participants perceived their engagement to the game at lower degree, while enjoyment at higher. The variance was similar between the constructs.

Constructs	Questions	Cronbach's	Item-Total

		alpha	Correlation
Continuation Desire	CD1	0.8069	0.7403*
	CD2		0.7105*
	CD3		0.7613*
	CD4		0.8127*
	CD5		0.6917*
Engagement	EG1	0.8584	0.8476*
	EG2		0.9190*
	EG3		0.8545*
Motivation	MV1	0.4469	0.5387*
	MV2		0.6816*
	MV3		0.7680*
Flow Experience	FE1	0.6517	0.7931*
	FE2		0.5717*
	FE3		0.8810*
Enjoyment	EJ1	0.8704	0.9320*
	EJ2		0.9407*

Table 2: Internal Reliability; CD1, CD2 etc. stand for each question used in the questionnaire; '' marks reached significance level 0.005*

The Cronbach's alpha (Table 2) suggests that three out of five construct's items are consistent and reliable to answer each of the construct, while motivation and flow was unable to reach the acceptable value. Item-total correlation suggests that MV1 (goals) question does not answer motivation construct well. Flow was just lower by the suggested value, and item-total correlation suggests that this is because of FE2 (attention focus) question. Thus, the consistency of MV1 and FE2 questions regarding the constructs (flow and motivation) is questionable, although the values of Spearman's rho are at statistical significance of $p<0.005$.

Constructs	Questions	(FL)	(CR)	(AVE)
Continuation Desire	CD1	0.6703	0.7467	0.3775
	CD2	0.4619		
	CD3	0.5730		
	CD4	0.7625		
	CD5	0.5615		
Engagement	EG1	0.4791	0.5743	0.3145
	EG2	0.5225		
	EG3	0.6640		
Motivation	MV1	0.4475	0.5882	0.3295
	MV2	0.5527		
	MV3	0.6949		
Flow Experience	FE1	0.4475	0.4420	0.2089
	FE2	0.4621		
	FE3	0.4615		
Enjoyment	EJ1	0.8479	0.7970	0.6629
	EJ2	0.7790		

Table 3: Convergent Validity; calculated by factor loading (FL), construct reliability (CR) and average variance extracted (AVE)

Convergent validity (Table 3) is the first step to calculate construct validity. The factor loadings are calculated to check how well the items of the constructs converge on one specific factor. Mathematically it is an arbitrary factor but in this case it is expected to be continuation desire. The results suggest that one item of each CD, engagement and motivation does not share the same attributes of continuation desire. Also, all items of flow experience. Although, these factor loadings barely miss the suggested value of 0.5. This suggests that all the questions converge and share the same attributes of a single factor, especially enjoyment with the highest factor loadings.

Construct reliability shows how consistent the constructs are. Flow experience has the lowest values, while engagement and motivation are just below the suggested alpha value 0.6. The average variance extracted shows the degree of variance there are within the constructs in relation to the random measurement error. Flow experience ranks highest, with enjoyment the lowest. Thus, the convergent validity of the constructs suggests that flow experience is less consistent in reliability and the degree of variance.

Construct	CD	EG	MV	FE	EJ
Continuation Desire (CD)	**0.614**				
Engagement (EG)	0.206	**0.569**			
Motivation (EJ)	0.393	0.297	**0.574**		
Flow Experience (FE)	0.179	0.336	0.469	**0.457**	
Enjoyment (EJ)	0.340	0.118	0.595	0.222	**0.814**

Table 4: Discriminant Validity in bold; squared correlations in normal font

The acceptance point for the discriminant validity (Table 4) is when it is greater than the squared pair correlations. The results show that enjoyment is unable to do so when comparing to motivation and motivation when compared to flow experience. This shows that they are related while they should not be, regardless, this was expected as the related work section showed that the constructs could possibly be connected. Therefore, discriminant validity of the constructs is sufficient.

The measurement model was compared to five different estimated models. Model fit indices and their estimated values are as follows (X^2/d. f: 10.73*; d. f: 5; CFI: 0.111; TLI: -0.6; RSMEA: 0.56*; 90% Confidence Interval: 0.4 – 0.7; SRMR: 0.25). The model goodness of fit can be indicated if the results reach the suggested values. Unfortunately, none of the acceptable values were reached. This means that the model should be adjusted to a better fit (Hooper, Coughlan, and Mullen, 2008).

Hypotheses	Standard Coefficient	Standard Error	Z-statistic	p

H2 EG→CD	0.324	0.185	1.753	0.08
H2.1 MV→ EG	0.306*	0.142	2.159*	0.031
H3 FE→ CD	0.025	0.174	0.142	0.887
H3.1 EJ→ FE	0.288	0.235	1.229	0.219

Table 5: Hypothesis Test; '' marks reached significance level 0.05; '→' marks correlation between factors; EG-engagement, CD-continuation desire, MV-motivation, FE-flow, EJ-enjoyment*

The Table 5 above shows that the p-values for the hypotheses differ a lot from each other. Motivation that is connected to engagement has the best p-value, which is at significant difference *0.031,* while its standard coefficient is *0.306*. Engagement is connected to continuation desire with p<0.08 and standard coefficient of *0.324*. This suggests that due to the lack of significance it is not possible to calculate the strength of the intention (H1) to keep playing.

Discussion

The factor-model did not show enough evidence to suggest that casual players that are familiar with Candy Crush Saga would keep continuing playing based on the UX factors included in the experiment. Different explanations can be posited. For example, flow experience might not be an important factor because F2P mobile games are usually played in short bursts (Luton, 2013) (Fields and Cotton, 2014), with players not reaching the flow state and therefore not an optimal experience from the perspective of flow theory, which would motivate continued play. Possible ways of investigating this hypothesis could be extending the playtime, testing multiple times or adopting a more natural playing environment and –timescale.

The attempt to connect multiple complex facets of continuation desire in a factor model appears to be less significant than what previous research has indicated for studies of individual factors. A possible explanation for this discrepancy could be variance in measures at different levels of aggregation.

Enjoyment did not show to be correlated to flow at a significant level, although it was consistently reliable and valid construct. Also, factor loadings of enjoyment shared a lot of attributes towards continuation desire and could possibly be highly correlated to intention. This would be consistent with other research that found enjoyment an influential factor (Chang and Chin, 2011) (Lee M.-C. , 2009). Potential future work here could be to separate perceived enjoyment as a construct of continuation desire rather than flow. It may also help with improving the model fit, however, they are sensitive to sample sizes below 200, and therefore larger sample size in further research would be necessary.

Engagement showed overall good correlation to continuation desire, although p was just off of 0.05. This could possibly be due to the fact that engagement was measured through invested time and effort components. The first levels of the game were quite simple and the participants did not need to put much effort into the play session. Also, participants' perception on how valuable their time varied, for some 10 minutes was a lot and for some it was nothing.

As this is an early work on factor model approaches through continuation desire, the theory that was used may not specifically fit into the chosen F2P mobile game. This could be evaluated by first employing a survey on specific mobile game players and second applying theory of user experience to identify best suited factors within the model.

In general, future work should focus on the adjustment of the factor model or even expansion to find the most suitable UX factors for continuation desire. The end goal is to produce a factor model that can provide value to user testing in game companies. It potentially could explain what UX constructs and their items are the most influential drivers of the game. This could be useful in user testing of understanding player behavior.

Conclusion

This paper contributes an initial approach towards measuring user experience through continuation desire in F2P mobile games. The results indicate that motivation and three of its items – goals, pass-time and entertainment, significantly influences engagement at a 0.306 standard coefficient. Engagement is also correlated to continuation desire but missing the significance difference. Despite widespread adoption in games research, flow experience showed the least amount of influence within the factor model, possibly due to the nature of F2P games which generally enable short playing sessions

The early work presented here represents the first step towards providing a factor model to help game companies identify UX components in their F2P games that drives continuation desire, i.e. to keep people playing.

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