

One Size Does Not Fit All: Applying the Right Game Concepts for the Right Persons to Encourage Non-game Activities

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Abstract. In this paper, we present some insights extracted from experiences with conducting three case studies that show how different game-based approaches affect people's motivation to encourage more activities in digital services. The first case study is a game-based English words learning application. The second case study is a gamified sharing economy service. The third case study is a persuasive service customized for a user's unique preference. The results of the case studies show that adopting only one approach is not effective to motivate all diverse people, and multiple approaches should be incorporated when developing digital services that motivate diverse users by game-based approaches.

Keywords: Gamification · Human motivation · Personality · Preference · Learning · Sharing economy · Healthcare

1 Introduction

Most young people have spent plenty of time playing video games because playing a game increases their pleasure and happiness [9]. Applying game concepts in order to motivate people to change or increase certain daily activities has already been recognized as a promising approach. Human motivation is an important aspect in our daily life [3] and game concepts can increase the human motivation artificially [12] and help to achieve a flourished society [6]. One of the most popular approaches is using a “serious game” [2]. A serious game usually looks like a typical video game, but the goal of the game is not to achieve fictional missions in a virtual world but to acquire practical skills in the real world or to increase the knowledge for preventing certain undesirable habits [10]. Another approach to encourage the change of people's daily activities and behavior is to use the “gamification” concept [4, 11, 21]. Gamification adopts game mechanics like points, badges and leaderboards in non-entertainment information services to engage their users.

The aim of this paper is to show that one game-based approach is not effective for diverse people, and multiple approaches need to be adopted in order to motivate larger and more diverse audience. For example, in [15], we show that each player's personality

has a significant influence on his/her motivation to play a trading card game, and thus there is a need to incorporate multiple ways to motivate people with different personalities.

In this paper, we present some insights extracted from experiences with conducting three case studies that show how different game-based approaches affect people's motivation. The first case study is a game-based English words learning application. The second case study is a gamified sharing economy service. The third case study is a persuasive service customized for a user's unique preference. The results of the case studies show that adopting only one approach is not effective to motivate all diverse people, and multiple approaches should be investigated when developing digital services to motivate diverse people by game-based approaches.

The remainder of the paper is organized as follows. In Sect. 2, we show a game-based English words learning application and the effect of different types of user motivations in the game. Section 3 presents a gamified sharing economy service and the effect of different personalities in the service. Section 4 shows a persuasive service customized for a user who has a unique preference. Section 5 discusses how to develop ludic services effective for diverse people. Finally, we conclude the paper in Sect. 6.

2 Designing a Ludic Solution Based on a Player's Motivation

In the first case study, we have developed a simple game-based English words learning application. The application has the following four versions. The first version (Type A) does not adopt any game concepts. The second version (Type B) uses the gamification-based approach. This version uses points and badges to motivate users. The third version (Type C) uses the serious game-based approach. In this version, a user plays the application in a fictional world, and some fictional rewards are given when missions are completed. The last version (Type D) adopts both the gamification and the serious game-based approaches. As shown in Fig. 1, we define a gamifying degree to indicate the strength of extrinsic influence on users. We have developed four games based on the gamifying degree as shown in Fig. 2.

In the experiment of the first case study, we classified users' personalities based on the following two factors. The first factor is the inherent motivation, and the second factor is the context-dependent motivation as classified in [8]. The inherent motivation indicates whether a person has high motivation to perform any activity. Conversely, the context-dependent motivation means that a person has a high motivation for performing only a specific activity; in this case, English word learning.

We conducted the experiment with 31 participants that were between 20 and 50 years old, and each participant played the respective four versions of the game. We first investigated each participant's inherent motivation and context-dependent motivation through questionnaires, and based on the results of the questionnaires categorized them into four groups, that were IM High-CM High, IM High-CM Low, IM Low-CM High, IM Low-CM Low, where IM stands for inherent motivation and CM stands for context-dependent motivation. For our experiment based on the preliminary questionnaires, the 31 participants were divided into these four groups as follows: 9 participants with IM

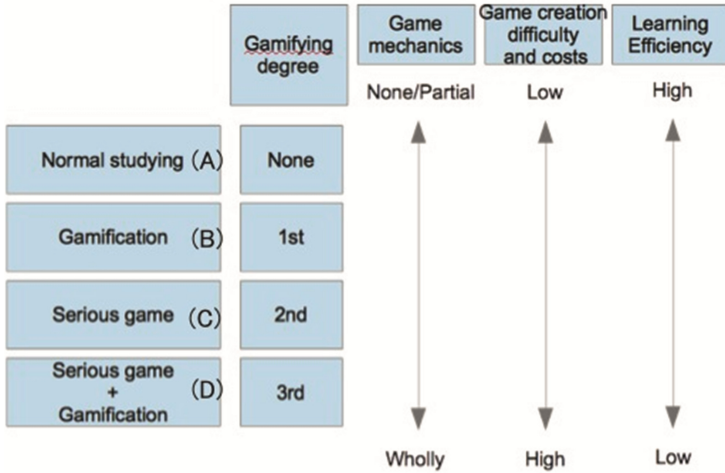


Fig. 1. Gamifying degree



Fig. 2. Four types of games

High-CM High, 3 participants with IM Low-CM High, 5 participants with IM Low-CM High, 14 participants with IM Low-CM Low. Then, the participants were asked to play the four different types of games described above. After participants completed to play the games, we conducted additional questionnaires based on the Bandura’s self-efficacy [1] scale to measure how a participant liked the games and how effective they were for their goals. The results of the experiment are given in Fig. 3. The figure shows two graphs for the results of each of the four groups the users were divided into, based on their inherent and context-dependent motivation classification. The right graph shows how

many people liked the approach and the left graph shows how many people felt self-efficacy in the approach for each game type (A, B, C and D).

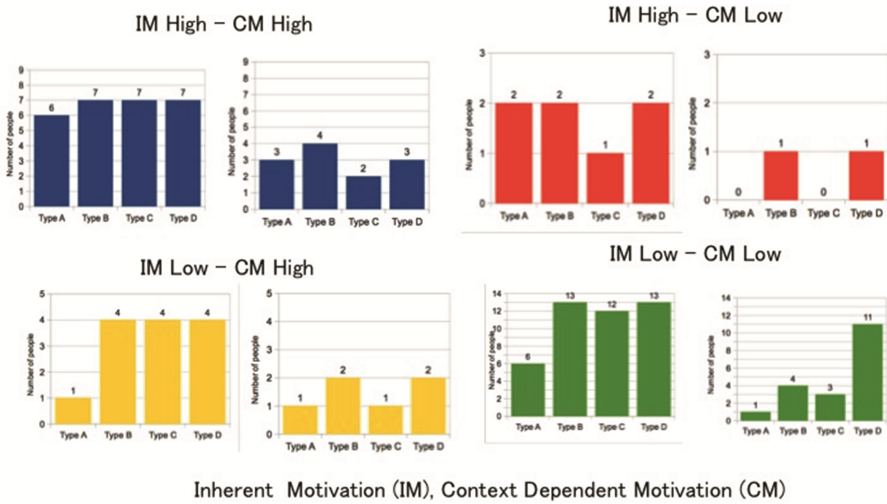


Fig. 3. How each game motivates participants?

From the results of the experiment, we first discuss the effect of the gamification-based approach as shown in Fig. 3 for each group that has different types of motivations. Based on the results, first we compare the effect of Type A and Type B; in this case, all users increase their motivations more in Type B than in Type A. Next, we compare the effect of Type C and Type D. Similarly, all users increase their motivations more in Type D than in Type C. This means that the gamification-based approach is basically effective for all users.

Second, we would like to discuss the effect of adding the serious game-based approach. We compare the effect of Type A and Type C; basically, when the inherent motivations are low, Type C is better than Type A, but there are not significant differences between Type A and Type C in other cases. However, when comparing Type B and Type D, Type D is significantly better than Type B if both motivations are low, but there are no significant differences between Type B and Type D in other cases. This means that the serious game-based approach is not effective when either motivation is high.

An important observation from the results is that when both motivations are low, combining the gamification-based approach and the serious game-based approach is effective for most people.

The results of the case study indicate that the effect of a serious game to introduce deep gaming experiences is not effective if a player already has either of the motivations. For him/her, the motivation to learn English words is high, so he/she wants to learn English words directly and the game effect disturbs his/her inherent motivation to learn English words. The strong game-based approach may kill a user’s motivation for the target activities. Also, it is hard to develop a serious game that attracts a user well. On the other hand, introducing gamification is basically effective for all participants. Also,

if a participant's both motivations are not high enough, the effect of a serious game increases the effectiveness of gamification.

3 Designing a Ludic Solution Based on a Player's Personality

The sharing economy referring to peer-to-peer-based sharing of access to goods and services has recently attracted a great deal of attention [5, 14]. The term covers a sprawling range of digital platforms and offline activities such as Airbnb¹: a peer-to-peer lodging service and Uber²: a peer-to-peer transportation network. The sharing economy typically uses information technology to provide individuals, corporations, non-profits and governments with information that enables the optimization of resources through the redistribution, sharing and reuse of excess capacity in goods and services. The sharing economy services have been recently growing rapidly world wide, but the popularity of the services in Japan is still limited. The purpose of this case study is to encourage the usage of these services to Japanese people by enhancing the services through game mechanics with the pop cultural atmosphere.

In the second case study, we have developed a gamified sharing economy service through storytelling to encourage a user to actively use the sharing economy service. In the service named "Osusowake" as shown in Fig. 4, each user can rent currently necessary goods from other users who do not need to use the goods at the moment to encourage sharing goods within a community. A virtual world is offered for the users in the Osusowake sharing economy. In a fictional story of the virtual world, the users become more active in the sharing economy with helps of a female fictional guide. The system adopts the following four gamification elements - badge, collection, rank and storytelling. In particular, we would like to compare the effects of storytelling with other typical gamifications elements; our study performed an experiment to evaluate the effectiveness of a game story to increase the motivation of a user.

In the experiment, we recruited 13 participants and conducted interviews with them. From the interviews, we found that storytelling helps us to understand what motivates a user. For example, a service is designed to teach a user why he/she needs to perform an activity presented in the story or why an activity is undesirable with concrete examples. If a user can learn the meaning of the activity that is particularly encouraged in a service or improve his/her attitude against currently undesirable activities for him/her through storytelling, the user can continue to perform the activities with his/her own internal motivation. This aspect is a very strong advantage of storytelling that other gamification elements do not have because traditional gamification elements usually increase only external motivation to encourage short-term activities.

We also conducted two personality tests for the 13 participants to check the personality of each participant and investigate the influence of a user's personality on the effectiveness of respective gamification elements used in the developed service. The first personality test: Bartle Test³ classifies a person into four categories depending on

¹ <https://www.airbnb.com/>.

² <https://www.uber.com/>.

³ <http://mud.co.uk/richard/hclds.htm/>.



Fig. 4. Osusowake sharing economy service

how he/she plays MMORPG (Massively Multiplayer Online Role-Playing Game). These four personality categories are: Achiever, Explorer, Socializer and Killer, and the test shows how and which personality is stronger than other personalities. Table 1 shows the results of Bartle Test for the participants in this case study. Big Five Test⁴ is a diagnostic test describing the human personality with five dimensions. In our current experiment, Bartle Test is more useful to present the effect of the personalities on gamification elements than the Big Five Test. Thus, in this paper, we only show the results of the analysis based on Bartle Test.

In the analysis to investigate the effect of gamification elements, we first classified all participants based on their highest personality score in Bartle Test as shown in Table 1 (for example, the first participant in the table is Achiever). We assumed a hypothesis that a person classified in a certain personality category in Bartle Test is engaged effectively by a different set of gamification elements. For investigating the hypothesis, we asked the participants to fill questionnaires before and after the experiment. The first questionnaire investigated how each participant expected the effect of each gamification element, and the second questionnaire investigated how each participant was actually affected by each gamification element after the game. Table 2 shows each hypothesis and the corresponding actual result. In the current experiment, only one participant had the highest score in the Socializer category so we omitted this personality in the table. As shown in the results, the gamification elements that we expected to offer strong effect were not actually the most effective.

We also analyze why our expectation is different from the actual effect in the experiment based on a participant’s personality. In the analysis, we investigate a participant’s personality whose personality score in Bartle Test is higher than 50 %. Therefore, 9 participants have the Achiever personality, 4 have Explorer, 7 have Killer, and 7 have Socializer personality as shown in Table 1.

⁴ <http://www.outofservice.com/bigfive/>.

Table 1. Personality scores in Bartle test

Participant	Achiever(%)	Explorer(%)	Killer(%)	Socializer(%)
1	60	53	40	47
2	40	87	13	60
3	20	80	40	60
4	47	73	20	60
5	60	33	40	67
6	53	33	93	20
7	60	33	80	27
8	67	33	40	60
9	53	33	87	27
10	40	40	67	53
11	60	33	60	47
12	80	27	60	33
13	53	27	67	53

Table 2. Hypothesis and results each category of Bartle test

Category Name	Effective Elements (in Hypothesis)	Effective Elements (Before Experiment)	Effective Elements (After Experiment)
Achiever	Badge Rank Collection	1st: Collection 2nd: Rank 3rd: Badge 4th: Story	1st: Collection 2nd: Badge 3rd: Story 4th: Rank
Explorer	Story	1st: Story 2nd: Rank 3rd: Collection 4th: Badge	1st: Collection 2nd: Story 3rd: Rank 4th: Badge
Killer	Rank	1st: Rank 1st: Badge 2nd: Collection 3rd: Story	1st: Collection 2nd: Badge 3rd: Story 4th: Rank

We first consider that a rank is effective and a collection is not effective for participants whose personality is Killer because they usually tend to like competing with others and to compare their ranks. However, the results after the experiment show opposite results, i.e. collection was the most effective and rank was the least effective element. We further investigated that this unexpected results happened because our design for the rank is difficult to be compared among participants, but the number of the collections owned by each participant can be easily compared, thus they can compete to earn more collections.

We next analyzed how the motivation of participants improved by every gamification element.

For Achievers, badges that can be earned by individuals are typically effective, but for Killers and Socializers, badges that can be compared with others are more effective than the badges earned by individuals because Socializers tend to increase the relationship with other participants through exchanging badges and Killers compete with each other by comparing acquired badges.

Collections in games that participants usually play tend to be effective for Explorers, but in our current system, collections were effective for people with any personality. We think that the reason for that is the fact that each participant's collections in our systems can be seen by other participants, thus it is effective for Killers to compete by explicitly showing the differences of their collections with others and for Socializers to increase their social relationship by exchanging their collections.

Ranks in games that participants usually play tend to be effective for all personalities, but in our current system, ranks appear to be not so effective for any personality. Many participants said that this is because there is no benefit to raise the rank in our current system. In certain games usually played by the participants, raising ranks also increases the effect of other gamification elements, but our current system is not well designed to offer such effects.

Storytelling is usually effective for Explorer because stories allow them to exploit the stories' worlds. However, from the experiment, we found that the stories are also effective for Socializers. The reason is that Socializers may enjoy the relationship with characters in the stories. For example, the story in *Osusowake* tries to establish the close relationships with a user. However, the effect of a story depends on a user's taste. If a user does not like characters or a view of the world in the story, the story is not effective to motivate the user.

We think that the following reasons might be the sources of the above results. The first reason is that the current design of each gamification element implemented in our system has a different level of completion. The second reason is that each gamification element that is targeted to a specific personality has unexpected effects on people who has other personalities. Our case study shows that analyzing services based on Bartle Test's personalities is a useful tool for designing services that motivate diverse people and identify possible pitfalls of the design.

4 Designing a Ludic Solution Based on a Player's Unique Preference

In the third case study, we present the effect of the game-based approach on changing undesirable everyday habits for people who are pop culture geeks and tend to sleep very late, which frequently causes their health problems. Most traditional persuasive technologies solutions tried to ensure that the average of users improve to change their habits. We have developed a game-based application that encourages pop culture geeks to sleep earlier by using stories told by their favorite virtual characters as shown in Fig. 5. In these stories, fictional characters present the importance to sleep earlier to users for maintaining their good health. The results of the experiment show that traditional game-based approach is not effective. However, our approach changes pop culture geek's undesirable behavior successfully.



Fig. 5. Playing the third case study

In the case study, we assume a player who likes the Boy's Love culture [13] as her unique preference. Boy's Love is a very popular pop culture for young girls recently, and there are many types of products and contents on the topic such as comics, novels, animations and games. In particular, it is a popular culture to create a Boy's Love game around a character that appears in well known comic or animation stories. The most important issues for a person who likes the Boy's Love culture is that the character appearing in the media contents is highly preferred by the person. Also, as shown in the past research, using a virtual agent is effective to persuade people [19, 20]. Thus, in this study, our game adopts virtual characters used in Boy's Love media contents, where the behavior of the characters and how they talk reflect typical manners of the Boy's Love culture. Therefore, a player of the case study believes that the virtual characters appearing in the game are very typical in the Boy's Love story.

We conducted an experiment to use the game to persuade the healthier lifestyle of a player who prefers the Boy's Love culture. We recruited 4 participants who liked the Boy's Love culture in the experiment. The case study is a game to persuade players to sleep earlier in the evening, to wake up early in the morning and walk enough every day. Typical people, who like Boy's Love usually stay up late at night and usually prefer to stay at home during the day. The purpose of the game is to improve the undesirable habits of the geek people through the persuasion by the virtual characters that he/she prefers.

In the experiment of the case study, we first checked the sleep time and wakeup time of each participant, and how many steps he/she walks a day before playing the game for seven days. The results are shown in Table 3, where results are the average for the seven days. Then, after playing the game, we checked again their sleep and wake up time and the number of steps they were doing a day. The results are shown in Table 4, where results are also the average of seven days. Table 4 shows that all the participants started sleeping earlier at night, they all had longer and healthier sleep for the night and most

of them walked more steps per day compared with before the experiment. From the results, we considered that the game is effective to change the users' undesirable habits. The results are very interesting because people who like Boy's Love usually have undesirable habits and it is hard to change their habits with traditional approaches for persuading people. However, the effect of the game is significant if the game takes into account a geek's preference.

Table 3. Results before playing the game

Participant	Sleep Time	Wakeup Time	Walk Steps
A	1:28am	6:26am	8639
B	2:05am	7:06am	6176
C	3:17am	5:35am	4256
D	1:35am	5:32am	6328

Table 4. Results after playing the game

Participant	Sleep Time	Wakeup Time	Walk Steps
A	0:11am	7:00am	10515
B	0:40am	8:19am	5929
C	0:45am	6:39am	8167
D	23:52pm	6:54am	9901

5 Design Implication for Designing for Diversity

In past work on gamification, some researchers claimed its ineffectiveness. On the other hand, other researchers claimed the effectiveness of the approach. The contradictory results may come from the small number of participants in these experiments, where there may be a strong bias in the participants among the experiments. The claim of our study can explain these results; they did not take into account the possibility of the bias caused by the participants' personalities or preferences in the experiments.

The results of the case studies indicate two interesting findings. The first finding is that it is important to take into account the type of a user's motivation. If a user is already motivated to achieve a goal, game concepts are not necessary to encourage him/her. On the contrary, introducing game concepts in this case may decrease the player's motivation significantly. The current gamification-based approach supports some light-weighted game mechanics like badges, points and leaderboards; the effects do not offer a great impact on human motivation, due to their shallow game experiences but future gamification will expand the scope and include deeper game experiences. In this case, designers need to be careful how the game mechanics affect a user's motivation.

The second finding is that it is essential to take into account a user's preferences and personality when designing deeper game experiences. In the second case study, we observed the effect of a user's personality on deeper game experiences. The third case study is customized based on a user's hobby. Most of the current gamification-based approaches have been designed for average people not diverse people. However, for flourishing our society, all diverse people need to be satisfied with their daily life. Our approach claims the necessity to design digital services for diverse people and offers some insights for designing gamification for all; it is essential to incorporate multiple approaches to attract diverse people. In particular, our essential contribution is to demonstrate that customized persuasive effects according to people's deep taste or preference are very effective. Even if the usual persuasion strategy for the average is not effective, the customized persuasion for people with a unique preference may work well.

Designing the semiotic meaning of the real world is a promising approach to systematically develop ludic digital services [7, 16, 17]. In particular, the real world should be meaningful for people to motivate them. As shown in [18], the diversity of users' preferences and personalities can be taken into account based on the approach. Also, incorporating fictionality into the real world is an effective technique to change the semiotic meaning, and offer more meaningful effect for persuading them. We will investigate how to enhance the insights extracted in the paper in the near future, and we will extend the framework shown in [18] to develop digital services to take into account people's diversity.

6 Conclusion

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