Measuring the Effects of Social Networking Features on Player Motivation and Engagement

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***Abstract*—Social Networking Services (SNSs) have become a powerful and ubiquitous form of social software with applications in a wide range of fields. Modern SNSs such as *Facebook*, *Google+*, and *Twitter* provide functionality for developers to integrate social features into their applications. Game developers have used this to produce highly popular social games, notably ones created by the company *Zynga* which reports over 240 million monthly active users. Despite the apparent popularity of social games, there exists a lack of scholarly justification for the inclusion of social networking features in games. Nonetheless, game developers operate under the assumption that these features motivate and engage players, and attract new users. Rather than continue this assumption, this study performed an experiment informed by established approaches to examining the effects of motivation and engagement, designed to measure the effects of in-game social networking features on players.**

Keywords—Social Networking Services, Social Networking, Game, Video Game, Motivation, Engagement

I. INTRODUCTION

The rise in popularity of social gaming in recent years [1][2] has seen a plethora of games such as "Farmville" [3], "Words With Friends" [4], "SongPop" [5], and "Mafia Wars" [6], become an integral part of the user experience for many users of Social Networking Services (SNSs) such as *Facebook* and *Google+*. Many other games also feature some kind of integration with SNSs such as the ability to "tweet" or post about scores, or compare performance with friends.

This popularity has also seen social gaming become highly profitable, with companies such as *Zynga* reporting more than 240 million monthly active users [7] and $US445 million in revenue in 2011 [8]. Additionally, larger game companies like *Activision Blizzard* and *Nintendo* have recognized the boom in social gaming and are currently working on their own ventures in the area [9][10].

Given that there appears to be an absence of academic investigation into the role and impact of social networking to game player motivation and engagement, there exists a need to study their effectiveness in order to determine whether the investment required to include such technologies is justified. There is a lack of any clear cut categorization of social networking features in games as intrinsic or extrinsic motivators and it remains unclear whether such features will motivate players.

To this end, this paper reports on a research project that was designed to determine the impact of including social networking features on game player motivation. It was expected that adequately addressing this question would provide future developers of games with a better understanding of the importance and effects of implementing social features in their games and how much time/effort to put into such features relative to the benefit they provide, as well as opening up new research opportunities in the field of social gaming.

II. BACKGROUND

The following literature is provided in order to describe Social Networking Services, their importance, their features, and their implementation in existing games. Furthermore, literature will be provided to describe how these SNSs may impact player motivation.

A. Social Networking Services (SNSs)

The following working definition used for the purposes of this work draws upon common themes found in existing definitions of SNSs [11][12][13][14][15][16]:

> *A social networking service is an online service which provides functionality for self-presentation through profiles, articulation of connections between users, and communication through sharing of media such as text, links, images, and video [17].*

Some definitions of SNSs are so broad that indeed almost any content sharing site could be considered an SNS [18][19], and a more comprehensive review of the literature on SNSs is provided in [17].

It is clear that these services have become commonplace in many parts of the world [11][20], with the prominent SNS *Facebook* reporting 618 million daily active users in December 2012 [21], and *Twitter* reporting 200 million active users, posting an average of 400 million "tweets" per day [22].

The introduction of open Application Programming Interfaces (APIs) into SNSs has allowed developers to interface directly with user profiles in their own websites and applications and has seen SNS integration spread dramatically,

to the point where SNSs are integrated into many of the applications which users use daily [11][23].

SNS integration has made its way into a many activity domains, including blogs and news [24], health [25][26], music [27][28][29], art [30], and advertising [31][32]. A survey of the top 10,000 sites on the Alexa rankings (one of the leading sources for statistics on commercial web traffic data) in May 2012 found 49.3% contained some kind of link to *Facebook* (official plugin or otherwise), 41.7% for *Twitter*, and 21.5% for Google+ [33].

Similar to the increase in prominence of SNSs on the web in general, SNS integration and functionality is becoming more and more common in the field of gaming. Since this work looks at the effect of social networking in games, it is important to have an understanding of the ways this is being implemented in the industry. Thus, the following section describes a number of examples of social networking features commonly used in games.

B. Social Networking Features in Games

Social networking games have been described as ones which are distributed via social networks and feature social gameplay [34]. However, a broader definition could include games which are distributed via other channels but interface with either an existing SNS, or their own game-specific one. An example of the latter is LittleBigPlanet [35] which interfaces with the *LBP.me* website—a specialised SNS centered on the sharing and rating of community-made levels.

The following is a list of social networking features frequently included in games (further detail on these features can be found in [17]):

- *high score tables*: originally seen in arcade games to keep track of the highest score obtained by players [36], these have evolved from localised tables (stored only on individual devices) to SNS powered tables with global leaderboards and lists filterable by SNS connections (friends), to the point which *Facebook* has released a "Scores API" for this purpose;
- *chat*: communicating with other players either in-game or cross-game using text, voice, and video;
- *game invites*: sending requests using an SNS notification or messaging system to other players to start or continue playing a game;
- *sharing of scores and in-game events*: when a player accomplishes a task such as completing a level, defeating an enemy, or reaching a score they are proud of, they are given the option to share this information as part of their SNS profile;
- *challenging of friend-scores and bragging*: similar to the above, when a player beats another players score in a game, they are given the option to "brag" about the score, or send a request for them to try and do better;
- *in-game avatars and in-game profile pictures*: where the pictures are sourced from SNS profiles;
- *item trading and gifting*: where in-game items can be shared amongst friends, and notifications of this are sent via the connected SNS;
- *teamwork and requests for help*: players can be rewarded for helping out other players;
- *in-game content sharing and rating*: similar to trading, however the content is player-made (e.g. community levels and items); and
- *logging in using an SNS account*: allowing users to register an account on their websites by logging in using their SNS accounts (thus enabling many of the features listed above).

It is not immediately clear why these features are being included in video games. There appears to be an assumption that these features help improve engagement—the aspects of an activity which "pull people in" [37]. It has been said that for the period of engagement, users should be provided with feedback of what the system is doing, feel in control, and feel connected to the technology (through interactivity), and other people (through social awareness) [38]. Arguably, by definition, social networking features in a game should increase the ability of a player to feel connected to other people, and therefore, feel more engaged.

The focus of this work is on measuring the effects these features have on player motivation and engagement, and so the following section examines social networking features in the context of motivation literature.

C. Motivation Theories

A simple definition of what it means to be motivated is "to be moved to do something" [39]. Motivation has also been defined as a "hypothetical construct that is used to describe the internal and/or external forces that lead to the initiation, direction, intensity, and persistence of behaviour" [40].

Prevalent theories of human motivation such as Self Determination Theory (SDT) [41], indicate that there are two main types of motivation: *intrinsic* and *extrinsic*.

Extrinsic motivation is where an activity or behaviour is pursued to attain some kind of "separable outcome", or to "access desired end states or to avoid adverse ones" [42]. Until the beginning of 1960s, most studies into motivational effects used experimental paradigms which focused almost entirely on extrinsic forms of motivation [43] and it wasn't until a study by White [44] that the concept of intrinsic motivation was acknowledged.

Intrinsic motivation relates to when a person pursues a behaviour or activity for its "inherent satisfaction", because it is "inherently interesting", or "for their own sake" [39][42]. SDT suggests that intrinsically motivated tasks may satisfy "innate psychological needs" which are [41]:

- *competence*: relating to efficacy and ability;
- *autonomy*: concerned with will and independence; and
- *relatedness*: which is to do with social connectedness.

SDT has been applied to the study of video games [42][45][46][47][48][49], including in-game factors of competence, autonomy, and relatedness, as well as adding factors of presence (how immersed the player was in the game environment), and intuitive controls (how quickly the player grasped the game's controls).

A different theory on intrinsic motivation which is also based on human needs was proposed by Reiss [50] which consists of sixteen basic desires that motivate a person. Among these needs were social contact, acceptance, vengeance, and status—all of which may arguably be enabled by social networking features.

Categorising social networking features as extrinsic or intrinsic motivators is important in understand their true effect on player motivation as there is considerable empirical evidence to suggest that rather than being separate, intrinsic and extrinsic motivation can be negatively interrelated, and undermine each other [39][43][51][52][53][54][55][56]. A notable study into this was performed by Deci [51] which found that participants who were given an extrinsic reward spent less time on a puzzle-solving activity when that reward was taken away than those who were never given a reward in the first place. Another study with children playing with Magic Markers found similar results [52]. Despite these findings, a meta-analysis of 96 studies on the matter found that removal of tangible extrinsic rewards and reinforcement have minimal or no effect on intrinsic motivation [56].

To add to the complexity of intrinsic and extrinsic motivators, there exists a sub-theory of SDT—Organismic Integration Theory [57]—which is focused on extrinsic motivation taking on different forms through a process of internalization. This means extrinsic motivators can become increasingly intrinsic to an individual, and can make it difficult to disentangle intrinsic and extrinsic motivators for a task.

It is difficult to determine whether the social networking features described previously are intrinsic or extrinsic motivators. A feature like a high score table is arguably extrinsic as the prestige involved in being near the top of the table is an extrinsic reward for completing the activity well. On the other hand, high score tables can also provide intrinsic motivation, as players can define goals of beating their previous score or a particular person's score as motivation to continue playing. Features like chat or item trading facilitate intrinsic goals which are self-defined or extrinsic goals such as in the example of the Pokémon series where trading with a friend is used to progress in the game and the extrinsic reward of a reasonably rare Pokémon is given to the player [58].

In SDT terms, arguably most social networking features by definition help satisfy the relatedness need and the in-game relatedness need proposed by the modified version of SDT for video game motivation. Additionally, features like high score tables, score sharing, or bragging can help satisfy the competence need; for example a player may feel competent in a game if they have made it into the high score table, and they might like to brag about this by sharing their score in order to enhance their satisfied need. It is important to note that there may also be demotivating factors present in such features, such as not feeling competent because you are not good enough at the game to make it into the high score table.

Early work into what makes games fun and enjoyable found four individual motivating factors: challenge, curiosity, control, and fantasy, and three additional interpersonal motivating factors: cooperation, competition, and recognition [59][60]. These interpersonal factors are arguably provided by all of the social networking features described previously, and may also stimulate the individual factors of challenge (e.g. by providing goals of beating another's score), and control (e.g. having the best score may indicate to a user they are more masterful of the controls of the game). Social networking features should help enhance these factors while playing a game while high score tables can add an extra level of challenge to a game, by always providing a goal to try and beat (i.e. if there is a player with a higher score, or if you have the highest score, and you are trying to improve on that score).

Studies which claim that the removal of extrinsic motivators having a negative effect on intrinsic motivation have interesting implications for the area of gaming. If features like high score tables truly are extrinsic motivators then could players who are used to these features be less intrinsically motivated when playing subsequent games without these features because the external reward is no longer there? Or could a failure to be highly ranked demotivate players who have been conditioned to expect an extrinsic reward? This raises the question of whether or not game developers should all rush to include such features in their games in order to avoid this lowered intrinsic motivation, and be worried about producing games which don't include these features. Alternatively, it could be that developers could choose to take a long-term view and avoid adding such features as their popularity may reduce over time.

Due to the difficulty in categorising social networking features as intrinsic or extrinsic, and the resulting uncertainty in whether or not these have a positive or negative effect on player motivation, there is a need to test the motivational effect of such features. The following section describes an experiment which was performed in order to measure this.

III. METHODOLOGY

In order to better understand the effect of social networking features on game player motivation, an experiment was conducted to quantitatively measure this impact. To facilitate this experiment, a social gaming website was developed to host games that included a selection of the social networking features and captured data on players as they played these games. The following sections of this paper describe the development of the social gaming site, the games included in the study, and process of collecting data used to determine the impact of social networking on game player motivation.

A. Site Design

To facilitate this research, a small-scale social gaming site was built. This was done instead of attempting to obtain data from an industry platform like *Facebook*, as the matter of mining the back-end database for time logs and other data would be nontrivial, in most cases not possible, and potentially

be in breach of the terms and conditions of the system [61][62]. Additionally, if the games had been hosted within Facebook it would have been more difficult to have a control group without social networking features.

The site was written in *PHP* with a *MySQL* database used to store all collected data. The games hosted on the site were developed in *Adobe Flash* and were viewed inside a web interface. A back-end web interface was also written in PHP to interface with the database which was designed to facilitate research and with data mining in mind.

The site itself contained the following features which one might expect to see on any social gaming site:

- *persistent profiles*: which store information between visits, and can be browsed by other users;
- *friends*: allowing users to specify which other users on the site they have a connection with;
- *linking a site account with a Facebook account*: to enable social networking features in the games; and
- *achievements*: rewards which are given "for the completion of specific in-game challenges" [63], included to facilitate another research project running on the same site [64].

B. Game Design and Social Networking Features

The developed GamingThe.Net site contained nine simple *Adobe Flash* games in order to achieve a suitable spread of across game genres. Four games were developed by the research team specifically for the purpose of this study, and a further five were developed independently, which were then modified to include social network integration. The games were designed to be easy to play (or selected because of this quality) so as to keep the games within the same style as many existing social networking-enabled games such as "Angry Birds" [65], "Cow Clicker" [66], and "SongPop" [5]. Original games were developed in order to avoid bias from previous experiences with existing games and allowed the research team to have complete control over what features were to be included in the games.

Each game contained a set of the following social networking features:

- *high score tables*: able to be filtered both globally and friends-only;
- *Facebook profile pictures in-game*: both in high score tables and on in-game character avatars;
- *score sharing and bragging*: posting to *Facebook*; and
- *next to beat highscores*: displayed in the corner of the screen;

These features were chosen as they were the most suitable for a social gaming site of this size, and represented some of the most commonly implemented social networking features in games.

C. Data Collection

Based upon the work described in the background section, two main measures of player motivation and engagement were identified: time spent on the task in question, and the participant's performance in completing the task. Other measures were considered, such as willingness to volunteer [56]; self-perception of motivation by the participant to be collected using a survey [43][45][56][55][67][68][69]; and physiological factors such as heart rate, respiration rate, peripheral skin temperature, and skin resistance levels [69][70][71]. However, they were considered beyond the scope of this research project due to time constraints and lack of access to measuring apparatus.

1) Time

The main feature of data that was collected was the length of gaming sessions for participants. Time spent on a task was a commonly used measure among the experiments on motivation—particularly measuring how long people spend doing things in a "free time" period where they could easily do other, more interesting things [48][51][52][54][56][72]. Other studies used factors relating to time such as "preference for future play" and "continued play behaviour" [45]. Based upon these previous studies on motivation, where more time spent indicated increased motivation, longer game sessions from users of the site were expected to indicate that participants were more motivated while playing the games. Also considered was the number of game sessions per player, and the number of subsequent game sessions for each player per game.

The site automatically recorded the following information for each session:

- the player's ID on the site;
- the game being played;
- session start timestamp; and
- session end timestamp.

Note that a "session" refers to the period of time from when the initial loading screen of the game disappears to when they navigate away from the web page with the game on it.

2) Task Performance

Task performance was considered as a measure of motivation by a number of previous studies [73][74][75][76][77][52][54]. For this study, as achievements are awarded for completion of in-game challenges, the total number of achievements earned was used as a measure of player performance. For more information on achievements, and their particular use in the "GamingThe.Net" site, see [64].

D. Participant Selection and Experiment Design

Since the measures of motivation chosen for this project were based upon usage data from users of the site, participants were required.

Participants were asked to register an account on the GamingThe.Net website. Registration on the site was open to anyone over the age of 18 in order to simplify ethics approval. Opportunistic sampling was used as the website was

advertised by way of posters as well as via SNSs *Facebook*, *Google+*, *Twitter*, and *Tumblr*. Additionally any sharing of in-game scores etc. by existing participants on the site acted as further advertisement to those users' SNS friends.

Participants were randomly assigned to one of two groups: the Social Group or the Control Group. Participants in the Social Group were exposed to the social networking features by playing the games on the site with the features enabled (with extra pages for finding other users and comparing achievements enabled), whereas those in the Control Group had the features completely hidden from them in their experience on the site in order to allow for comparison between users with and without such features. An exception to the random group assignment rule was when a new participant was referred to the site via a system-generated *Facebook* post; they were automatically assigned to the Social Group as they would be expecting to see some kind of *Facebook* integration on the site. Additionally, users initially assigned to the Social Group were given the option to not link their account to *Facebook* if they did not wish to do so (a common practice for sites which allow for *Facebook* linking), and in the event that they didn't link their account they were reassigned to the Control Group.

Participants were asked to play the games on the site during their free time, and were not monitored visually. Participants could access the site from any computer with an internet connection. This was done in order to mimic the way in which people would normally interact with social gaming sites—in their free time. The period of time in which the site collected was seven weeks—long enough to allow new participants to discover advertisements for the site.

E. Data Analysis

As the logged data for play times, total play sessions, subsequent play sessions, and achievement data all had a skewed distribution, all tests were undertaken with the non-parametric Mann-Whitney U-test [78] (as an alternative to the Student's t-test) with the null hypothesis that the median for the two groups would be the same.

Comparisons for the factors described above were also performed within the data for each game using the Mann-Whitney U-test. To make comparisons across all games, for each group a non-parametric alternative to the ANOVA test was performed—the Kruskal-Wallis one-way analysis of variance test [79]. The Kruskal-Wallis test is an extension of the Mann-Whitney U-test, and the Mann-Whitney test was used on specific pairs where significance was indicated by the Kruskal-Wallis test.

It should be noted that adjustments were made to the recorded time measurements for the Social Group in order to remove the unforeseen effect of extra loading times due to establishing connections to *Facebook*.

IV. Results and Discussion

The experiment attracted 32 participants, with an average age of 23.84 (SD = 5.02). The Social Group contained 19 participants (16 male, 3 female), while the Control Group contained 13 participants (all male). Unfortunately the gender split being heavily biased toward male participants (90%) was not ideal and means that the following results may not be generalisable to females. As a result of this split, statistics relating to gender were not considered for this study. Additionally, the un-equal group size for the Social and Control groups was not considered to be a problem, as the Kurskall-Wallis and Mann-Whitney U-tests both do not require equal group sizes for accurate results.

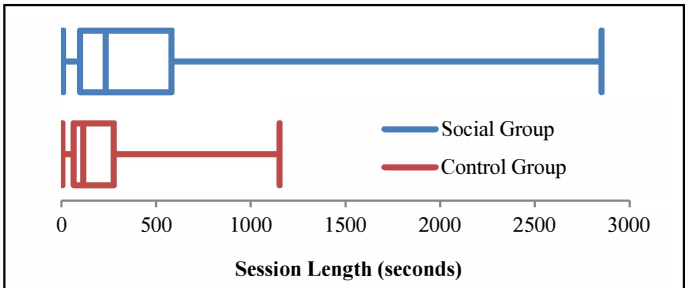

Fig 1. Box plot of session lengths for the Social and Control Groups.

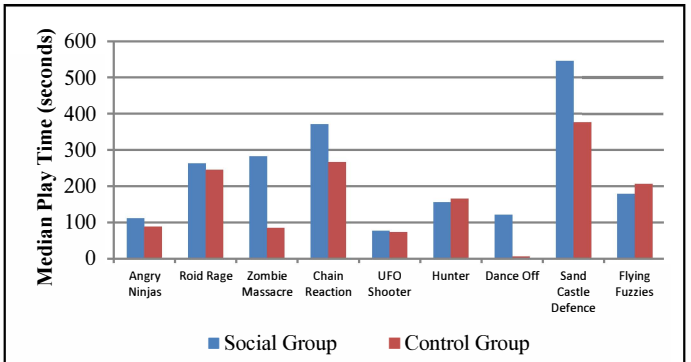

Fig 2. Median session length for the Social and Control Groups for each game.

A. Time

It was observed that the median session length of participants in the Social Group was 101% higher than those in the Control Group which may indicate that players in the Social Group were more motivated and engaged than those in the Control Group. This difference was found to be significant (Mann-Whitney U = 2,829.5, $n1$ = 154, $n2$ = 53, $p < 0.05$ two tailed) and a summary of the session times for the two groups is presented in the form of a box plot in Fig.1.

While numerous studies have used time as a measure of motivation and engagement in an activity, it is difficult to infer increased motivation using this statistic alone—especially since that on a per-game basis the difference in the medians between the two groups for each game was found to be not significant ($p > 0.05$ for each game, shown in Fig. 2). The results of the Kruskal-Wallis ANOVA test for differences in median session length per-game within the Social Group found there was some variation for each game ($H(2) = 34.73$, $p < 0.05$). However an examination of the games with higher median session times showed that these games did not have more social networking features than the others.

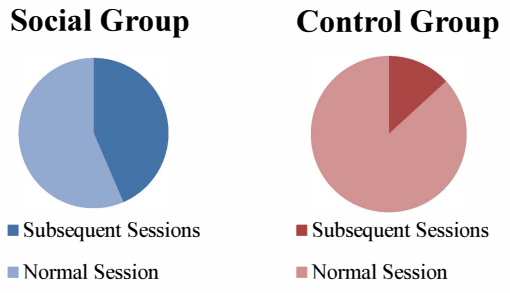

Fig 3. Comparison of proportions of subsequent play sessions for the Social and Control Groups

Taking the number of users in each group into account, of the 207 play sessions by the Social and Control Groups, 70% of the sessions were played by the Social Group. This difference in proportions may indicate that those in the Social Group were more motivated than those in the Control Group since they used the site more. This result is clouded however by the fact that the median number of play sessions for each player in the Social Group was 7 (SD = 7.66) and 3 (SD = 2.87) for the Control Group—a difference which was found to not be significant (Mann-Whitney U = 84.5, $n1$ = 19, $n2$ = 13, p = 0.1345 two tailed).

The proportion of users in the Social Group who participated in at least one subsequent game session (58%) was higher than the proportion of users of the same criteria in the Control Group (31%). This difference in proportions was only significant at the .10 level, and not the customary .05 level (p = 0.0654, one-sided).

In terms of the number of play sessions from each group which were subsequent play sessions, 67 (44%) of the play sessions by users in the Social Group were subsequent ones, compared to 7 (13%) for the Control Group (Fig. 3). This difference in proportions was found to be significant ($p < 0.05$), possibly indicating that those in the Social Group were more motivated to return a game than those in the Control Group.

B. Task Performance

The median number of achievements earned by players in the Social Group was 44 (SD = 44.83), compared to 21 (SD = 30.03) for the Control Group, however this difference in medians was determined to be not significant (Mann-Whitney U = 87.5, $n1$ = 19, $n2$ = 13, p = 0.1672 two tailed).

A lack of statistical significance in the task performance measure only makes the positive results for the time measure even more open to mixed interpretation.

V. Conclusions & Future Research Opportunities

The guiding research question for this study asked whether in-game social networking features motivated or engaged players. A literature review encompassing social games and the SNSs they interface with, and the field of motivation and engagement was presented in order to provide an understanding of the concepts this project covers, and to describe the ways in which the research question could be addressed.

Social networking features from the literature review were implemented and added to the games within the site described with the aim of identifying measures of motivation and engagement of participants.

The results were promising as a possible indicator in enhanced game player motivation as they indicated that adding social networking features did have some effect on the players exposed to them—with a 101% increase in the median play time found for the Social Group over the Control Group, as well as the Social Group having 100% more play sessions than the Control Group. Unfortunately, these findings were not repeated on a per-game basis—however it is strongly suspected this result was related to the sparsity of data-points per-game.

There is clearly a need for further research into the strength of this effect, and a number of future experiments based upon this work have been identified.

While the intent was to reduce genre bias, the larger selection of games impacted on the clarity of the results. Therefore a repeat of this study's experimental design should be performed with a reduced set of games (or just a single game) with an aim to leverage the larger communities of already established games.

A future project based upon these findings might also integrate the social gaming site more tightly with *Facebook* to better emulate existing social games. In the use of our own hosting site, in order to disallow our control group access to social networking features, we unwittingly introduced a further barrier to gaming with the need for a registration process to facilitate *Facebook* linking and our ethics requirements. In modern social games, users are generally able to begin playing a game immediately without the need for a complicated sign up process (this is automated by SNSs like *Facebook* or Google+), and similarly for non-social games normally users can begin playing without any registration on the site.

Future work could also examine the effects of individual features, or differing amounts of social network integration in games. Instead of just having a Social and Control Group, future studies could attempt to isolate the effects of individual features.

Additionally in this study both the Social and Control Groups had achievements enabled, future studies on social games could vary the availability of achievements, in an effort to determine their effect.

Other future research projects in this area could focus on additional measures of motivation (such as physiological factors and self-reports) and consider approaches that would enable the classification of social networking features as either extrinsic or intrinsic motivators. It may also be worthwhile examining if there is a difference in motivation effects of social networking features for the different genders.

Studies like the one performed by Deci [51] examined the effects of introducing an extrinsic reward, and then taking

away that reward. Future studies into the motivational effects of social networking features could attempt to replicate this structure, where users begin without the features, are then given the features, before taking them away again. Or alternatively, a study could be conducted with three groups: one with social networking features in their games, one without, and another without social networking features but are given some kind of extrinsic motivator. Then, similarly to Deci, the extrinsic reward and the social networking features would be removed and a cross-comparison made between the two groups. Such an experimental setup could suggest whether social features are intrinsic or extrinsic.

In conclusion, this project has determined that social networking features do have some effect on the game-player experience and has highlighted the need for further experiments. With further experimentation and the pursuit of the many future research opportunities identified here, we may be able to better understand the motivating effects of social networking features, in order to provide future game developers with justification for including these features in their games as well as a better understanding of how and when to include them.

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