Perspectives from behavioral economics to analyzing game design patterns: loss aversion in social games

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Abstract
In this paper we show through examples from social games as to how theories and hypotheses from behavioral economics can explain the (un)wanted effects from certain game design patterns that have especially been utilized in social games. We propose that game design pattern literature and game design in general could greatly benefit from taking into account the theories that explain why the mechanics work. We exemplify this by presenting how behavioral economic biases related to the loss averse tendency of decision makers could explain the effects arising from some of the core game mechanics in social games. Loss aversion is one of the cornerstones of behavioral economics and prospect theory.

Keywords
Behavioral economics, social games, game design, online-games, persuasive technologies, prospect theory, loss aversion

ACM Classification Keywords
J.4 [SOCIAL AND BEHAVIORAL SCIENCES] – *Economics*
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General Terms
Economics

Introduction
In recent years, developments in game industry have opened up new areas, such as social games and the gamification of (non-game) services where the goals of game design reaches beyond, what can be regarded as, its traditional functions. While the game mechanics themselves have not changed, the goals that designers are attempting to meet through game design have become more varied, for example, game mechanics are increasingly used in marketing [7][8], persuasive purposes [4] and even to "fix reality" [15]. This consequently affects the selected set of game mechanics and their particular implementation into a given game or service. Social games and other micropayment enabled services particularly have shifted towards more complex balance between "fun" and business metrics, such as acquisition, retention and monetization.

While these developments entail multiple new perspectives to what criteria could and should be used for analyzing game design patterns, one of the main veins in the discussion has been the psychological biases that game design patterns utilize to direct player behavior towards retaining the players, enticing them to contribute content and, of course, buy more products.

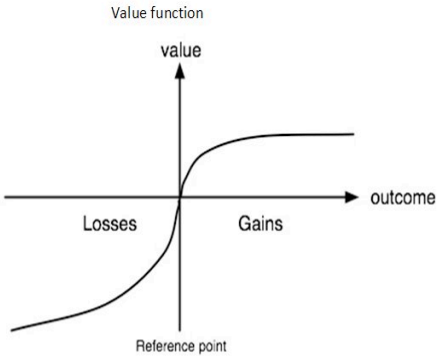
Therefore, it might not be surprising that one vein of popular discussion around game design in social games has taken the form of criticism. In some instances, social game developers have been blamed for ruthlessly designing their games to be sort of money-making systems by harnessing psychological biases (see e.g. [2]) and in the process shifting the players' motivations from intrinsic ones to extrinsic ones [9]. Additionally, it seems that these business successes in using persuasive game mechanics have sparked the gamification hype, which appears to be a quickly widening market niche that has lured many companies (e.g. SCVNGR, Gamify Inc., BigDoor) to produce long lists of persuasive game design patterns. However, the efforts for explaining to what actual biases the game mechanics are related to and how they function have been ambiguous.

Therefore, it seems that the current game design pattern literature (e.g. [3][17]) could greatly benefit from taking into consideration the behavioral theories that can provide explanations for emerging dynamics from game mechanics. Some works [14], however, have taken the initiative towards more theory-driven game design pattern building. In this sense, this paper can be seen as part of the continuum of the meta-discussion on re-thinking what attributes should be included in game design pattern descriptions and analysis.

As a part of this vein of research, in the next section of the paper we describe some basic behavioral economic biases related to the prospect theory that might explain some of the effects stemming from core game mechanics in social games.

Behavioral economics in social games
Behavioral economics, prospect theory and loss aversion

Behavioral economics examines human decision making in economic situations. One of the most prominent



Source: Kahneman and Tversky, 1979

Figure 1. (Hypothetical) Example shape of the value function in prospect theory [12]

theories of behavioral economics is prospect theory [12] that has emerged as counter-argument for the neo-classical expected utility hypothesis, which assumes that humans are rational agents, always able to maximize utility in a given decision situation. According to prospect theory, however, people make decisions based on *changes* in wealth from a reference point instead of *total amount of* wealth.

Gains and losses: Status-quo bias, endowment effect and sunk cost-fallacy

Central assumption of prospect theory is that "losses loom larger than corresponding gains" [12], which imply that losses have greater impact on preferences than gains. For example, losing one dollar yields more dissatisfaction than gaining one dollar would yield satisfaction. There are several biases related to loss aversion. The most established of them are status-quo-bias, endowment effect [11] and sunk cost fallacy [1][12]. Status-quo bias refers to peoples' tendency to maintain their current situation or assets. Endowment effect, on the other hand, refers to the same phenomena being amplified if the losses were owned by the decision maker, which implies that people value goods that they own more than identical goods that they do not. Sunk cost-fallacy implies that people are far more willing to invest more effort in an activity that they have already invested in before. These effects commonly affect the decision maker in tandem.

The nature of social games and especially of those, which capitalize on the sales virtual endowments to users capitalize on the loss averse nature of the consumer. The more effort the user puts and/or money she invests, the more likely she is to keep playing because of the feeling of losing all the already incurred costs and acquired endowments.

For example, the popular mechanic in social games, where crops or other possessions decay unless the player logs in frequently taps into the loss averse tendency of users with the goal enticing the users to return in the game and consequently increasing customer retention.

While and if players might not feel intrinsically motivated to return to the service, they may return because of the obligation due to the strong perceived dissatisfaction from losing something (of course network effects can have a role as well, especially in social games). Game developers are then urged to sell virtual goods that alleviate the risk of losing something, such as crops. It would not be a big exaggeration to say that they are effectively selling ways to play less to players. For example, in FarmVille, the user can buy a tractor and fuel to make the harvesting easier only to alleviate the dynamics emerging from the usage of these kinds of design patterns in the first place.

Goal gradient endowment progress and quota effect. - "I have to complete this level before going to bed".

People tend to set *quotas* for themselves, which they are then strongly primed to fill [5]. This anomaly was observed for example in taxi drivers' behavior. Instead of working when there was an abundance of customers, they worked long hours every day regardless of the amount of customer only to fill the mentally set (daily) quota. The daily quota is set as a reference point and any negative deviation from it would cause strong dissatisfaction in accordance to loss aversion [6].

For example, World of Warcraft facilitates this bias by anchoring a daily quota of daily quests to 25 available per day. Players would hence be enticed to complete that amount regardless of possible diminishing returns.

While working towards filling these quotas the closer people get, the more effort they are willing to put towards reaching the goal (goal gradient effect [10][13]). The urge for reaching goals is further fuelled by endowment progress effect which refers to phenomena where people will be more likely to continue the activity in order to fill the set quota, for example a maximum amount of customer loyalty points if it came with free "starter"-points instead starting from zero. [16]

Progress indicators are heavily harnessed, especially in social games for their persuasive nature via setting clear goals and enticing players to keep playing. For example, in CityVille, the first 'quest' given to the player is to increase the city's population to 50, but the player does not start from beginning but she is given 30 population from the start, which is clever use of endowment progress effect, which according to the theory should increase the likelihood of the player carrying out the first quest and thus being more likely to be retained as a customer.

Conclusions & Discussion

Prospect theory and loss aversion seem to provide reasonable basis for explaining many of the behavioral phenomena stemming from the core game design patterns used in social games. The mechanics, targeted for player retention and monetization can be seen to alter either the reference point and/or utilizing the non-linear value function of the prospect theory. The effect of the pattern arises from people's tendency to be significantly loss averse, i.e. losing the crops they have planted would feel significantly worse than simply gaining an equal amount of crops would yield pleasure. Thus, the player is more likely to return than in a case where they would have been just offered the same amount of crops for free (See Table 1 below).

Many of the behavioral economic biases are still debated in relevant literature. The goal here was not to make any final claim on the working logic of presented game mechanics but to introduce a small set of biases from the field of behavioral economics and to illustrate them in action to lay some ground for further discussion on the subject.

Research on this area would not only significantly contribute to game research literature, but games with their massive data sets would also prove to be most valuable in contributing to theory building in behavioral economics and psychology.

Mechanic in a game	Phenomenon	Explanation
Appointment dynamic (investment of time and effort in the game which yields value later)	Sunk-cost fallacy (Kahneman & Tversky 1979; Arkes & Blumer 1985).	The effort put (sunk-cost) in plowing the field and planting seeds increases the perceived value of returning to the game.
Decaying property	Endowment effect (Kahneman, Knetsch & Thaler 1991)	The player is more likely to return to tend the endowments than in a situation where the player would have been simply given the same good.
"Would you like to share wealth with friends" [x] Yes, [] No."	Status-quo-effect & default bias (Kahneman, Knetsch & Thaler 1991; Samuelson & Zeckhauser 1988)	When framing decision alternatives, one alternative is framed as a default selection. It increases the likelihood of the player selecting that option.
Giving a player free virtual currency	Insensitivity to income changes (Bowman et al. 1999 in Camerer 2001)	The expectation is that the player gets used to the level of currency and tends to continue the same level of consumption regardless of negative changes is available currency.
Daily quests	Income quota anchoring (Camerer et al. 1997)	People tend to adhere to quotas they set themselves or that are set for them. Therefore, not completing the suggested set of daily quests would yield strong dissatisfaction, making the player more likely to spend more time playing
Free experience points or XP bonus (e.g. rested in World of Warcraft)	Endowment progress effect (Nunes & Drèze 2006)	If a player is initially given some amount of progression (for free), the player is more likely to start/continue the activity.
Progression indicators	Goal-gradient effect (Hull 1932, Kivetz et al. 2006).	The nearer to the goal a player gets, the more dissatisfaction losing or surrendering would yield. Therefore, the closer to the goal the player is the more likely she is to continue on.

Table 1. Loss aversion in social games

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