

# Effects of Leaderboards in Games on Consumer Engagement\*

Extended Abstract

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## 1 INTRODUCTION

Gamification is the process of adding games or game-like elements to a non-game task in order to encourage participation and engagement [8]. Gamification, as a means of engaging consumers [6, 10, 16], has become more and more popular and implemented in a range of user-oriented applications. However studies have shown that it may not always have the type of impact as initially projected [12, 13]. Gamification yields different, sometimes contradictory, results with regard to the engagement outcomes. Researchers have argued that gamification is not always properly implemented and may not have consistent positive effects [14], as the reward mechanisms and intensified competition could create a controlling gaming environment that could dampen the intrinsic motivation of the participants [13]. Therefore, it is important for businesses and organizations to be able to gauge the impact of gamified interventions and evaluate return on investment.

In this study, we first review prior research on consumer engagement, and posit that the different findings related to engagement outcomes may be due to the multi-facet nature of consumer behavior. Specifically, we divide engagement outcomes on four indicators and examine the effect of gamification on each of them: time-on-task, the number of attempts, the number of re-attempts, and the number of unique attempts. We compare differences between a control group and a treatment group in an informal learning environment across a 10-month period wherein a leaderboard was introduced in the treatment kiosk in the fifth month, allowing us to evaluate the change in outcomes while controlling for existing differences.

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## 2 LITERATURE REVIEW

Consumer engagement originated from the relationship marketing literature in the 1990s [1, 2, 16]. However, consumer engagement lacks a clear definition, and related psychological and behavioral outcomes tend to be context-specific [11]. For example, there is evidence that certain game elements may actually be negatively related to motivation [12, 15] or at least not associated with long-term behavioral change [4]. Prior literature that attempts to explain the contradictory findings in the effect of gamification generally agree that while gaming elements appeal to the intrinsic motivation of individuals by making the game more interesting and engaging, material rewards and the competition for reputation and ranking would actually hurt intrinsic motivation by making the individuals feeling coerced and controlled [15].

We propose that while external factors such as ranking and reputation could potentially exert social- and peer-pressure on the participants, the participants may adopt different coping strategies in the presence of such pressure [3, 5]. We integrate literatures on pride [21] and social comparison [5], and posit that while certain individuals may perceive the game environment to be controlling and harming their autonomy, other individuals may be driven to achieve higher symbolic places under the pressure.

## 3 RESEARCH MODEL AND HYPOTHESES

In certain studies, leaderboards are positively associated with time-based outcomes. Pride is a powerful motivator of time spent on a task [8] particularly when such pride is authentic and tied to a specific experience [19]. Leaderboards publicly display achievement and establish ranking, and may represent the opportunity for a consumer to take public ownership of an achievement. As such, we posit that there will be a significant increase in the average time spent at the kiosk among consumers as they would try harder to come out top of the competition. Following the same line of logic, leaderboards will likely encourage consumers to make more attempt when they run into obstacles. Literature has shown that even if a task is difficult, the prospect of experiencing pride at the end by achieving success is a powerful motivator [9, 21]. Therefore, we hypothesize that there will be a significantly greater number of attempts by consumers once the leaderboard is added.

On the other hand, the leaderboard is just as likely to be negatively associated with re-attempts and unique attempts. Specifically, unlike points and levels, leaderboard does not provide task-related feedbacks and error cues. Participants could

experience greater frustration when they perform below expectation but not knowing how to improve. Similarly, from a social comparison perspective [5], consumers may feel that attempting the game is not worth the effort as there are far better performers (i.e. top leaderboard scorers). As a result, we posit that the leaderboard will be negatively associated with re-attempts.

Lastly, we posit that the presence of a leaderboard will be associated with fewer unique attempts; in other words, fewer consumers will even attempt the game once the leaderboard is introduced. It may be that consumers feel that attaining a score comparable to that of high scorers is not very possible or economical. Social comparison in the form of a leaderboard may lead to a destructive form of competition and negatively affect motivation [7, 13]. If consumers are not competitive or are intimidated by competitive activities, the leaderboard may actually deter them.

#### 4 DATA SOURCES AND METHODOLOGY

We conducted the study at the Tech Museum of Innovation in San Jose, California. School-age students visit this museum and informal learning occurs by interacting with the mini-games at kiosks to achieve goals. Our data included multiple observations for visitors over the course of about ten months: November 1, 2015 through August 28, 2016. A leaderboard is introduced to one of the game kiosks, Net-builder, in the middle of the study period, this intervention allows us to evaluate if changes made to one kiosk were associated with changes in engagement outcomes.

#### 5 RESULTS

On average, consumer spend much longer time on Net-builder compared to other kiosks before the intervention. After the leaderboard was introduced to the Net-Builder kiosk, consumers spend an extra 60 seconds or about 35% more time per interaction at the Net-Builder kiosk. Contrary to our hypothesis, the addition of the leaderboard to the Net-Builder kiosk did not significantly affect the average number of overall attempts. This indicates that consumers are trying harder at each attempt, but not increasing the number of attempts. Average number of attempts made by consumers on Net-builder kiosk and other game kiosks were not significantly affected by the addition of the leaderboard. But the number of re-attempt decreased at the Net-builder kiosk compared to other kiosks, as we hypothesized, and unique attempts at the Net-builder kiosk also decreased after the leaderboard is in place.

#### 6 DISCUSSION

Consistent with existing findings on leaderboard effectiveness, our results suggest that leaderboards have both positive and negative effects on consumer engagement. Our findings confirm that leaderboards are not necessarily an overall effective mechanism for increasing engagement. While leaderboards may motivate certain consumers to pursue opportunities to demonstrate pride over achievement [20, 22], these game

elements may also introduce an element of competition, eliciting fear and aversion in other consumers [12]. The overall goals and culture of the organization need to be taken into account when leaderboards are implemented as a game element.

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