Gamification of task performance with leaderboards: A goal setting experiment

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ABSTRACT

The use of leaderboards is a common approach to the gamification of employee performance, but little is known about the specific mechanisms and mediating processes by which leaderboards actually affect employee behavior. Given the lack of research in this domain, this study proposes goal-setting theory, one of the most well-established motivational theories in psychology, as a framework by which to understand these effects. In this study, a classic brainstorming task is gamified with a leaderboard in order to explore this. Participants were randomly assigned to four classic levels of goal-setting (do-your-best, easy, difficult and impossible goals) plus a leaderboard populated with initials and scores representing identical goal-setting conditions. The presence of a leaderboard was successful in motivating participants to performance levels similar to that of difficult and impossible goal-setting, suggesting participants implicitly set goals at or near the top of the leaderboard without any prompting to do so. Goal commitment, a common individual difference moderator in goal-setting theory, was also assessed and behaved similarly in the presence of the leaderboard as when traditional goals were provided. From these results, we conclude that goal-setting theory is valuable to understand the success of leaderboards, and we recommend further exploration of existing psychological theories, including goal-setting, to better explain the effects of gamification.

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1. Introduction

In the organizational context, gamification is a promising avenue by which to increase employee task performance (i.e., in-role behavior), one dimension of individual work performance (Koopmans et al., 2012). By directing and rewarding employee attention to particular focal tasks through goal setting, performance can be improved (Locke & Latham, 2002). Although there are at least forty years of research describing how motivational interventions can be used to alter task performance with goals (e.g., Latham & Baldes, 1975), little empirical research is available exploring the use of gamification as such an intervention (Hamari, Koivisto, & Pakkanen, 2014), despite the use of goals as a key component of most gamification interventions.

The specific way that goals are implemented differs between traditional goal-setting efforts and gamification. In traditional goal-setting, a single specific goal (or group of goals) is set for an employee to achieve. There is even something approaching scientific consensus as to which types of goals are the most motivating: those which are specific, measurable, attainable, realistic, and time-bound (SMART; Moskowitz & Grant, 2009). When a goal is provided to employees, employees can choose whether or not to pursue that goal. Within gamification efforts, the use of points and leaderboards, two of the most common types of gamification, can both be interpreted as applications of non-optimal goal-setting. When points alone are implemented to track achievement, there is no specific goal to pursue. Instead, the employee decides what quantity of points is worth pursuing. Similarly, a leaderboard presents many possible goals representing the prior performance levels of all those appearing on it. Thus, both points and leaderboards require employees to set their own goals, which is a more subtle attempt at behavior modification than traditional goal-setting interventions. In most organizations, supervisors are unlikely to make placement on a leaderboard a job requirement; however, the mere presence of the leaderboard may imply this.

Given this, we contend that because the effectiveness of goal setting has been extensively explored in psychology, it will serve as an effective basis for understanding the effectiveness of

leaderboards and the point totals they present. Experimental research in particular is critical on this point, because it is the only approach that can provide causal evidence of impact by managerial efforts on employee and ultimately organizational performance (Pedhazur & Schmelkin, 1991). Thus, the purpose of this paper is to respond to calls by Hamari (2013) and Landers and Callan (2011) by experimentally examining the effectiveness of goal-setting theory to explain observed changes in task performance resulting from a leaderboard intervention.

1.1. Effects of gamifying with leaderboards

Preliminary empirical evidence is available for the effectiveness of leaderboards to alter a variety of outcomes. In the learning context, Dominguez et al. (2013) examined differences between students quasi-experimentally assigned to view leaderboards ranking badge attainment, finding that students viewing the leaderboard scored higher on some assignments but lower on others. Eickhoff, Harris, de Vries and Srinivasan (2012) included leaderboards as part of a larger game to encourage flow states. Although the effects of leaderboards were not isolated in their research design, the researchers concluded that the inclusion of leaderboards "was a moderate success" (p. 9) in encouraging competition. In the context of web-based social communities, Farzan, DiMicco, Millen, et al. (2008) added leaderboards as part of a larger incentive system to a website, finding increases in user contributions four weeks after deployment. In a crowdsourcing application for conversational modeling, Halan, Rossen, Cendan, and Lok (2010) incorporated leaderboards alongside narratives and deadlines to increase participation, finding that participation increased but that those participating were more likely to behave unrealistically while conversing.

It is difficult to conclude in any of these studies that leaderboards, specifically, caused the observed effects reported, because leaderboards are rarely experimentally isolated as a gamification technique. When leaderboards are included in experimental conditions with other game elements, like badges or narrative, the presence of those additional game elements or any interaction between leaderboards and those game elements may actually be driving experimentally observed differences. Such designs may speak to the ability of gamification to affect outcomes generally, but they do not help to explain the effects of leaderboards specifically. From the standpoint of practice, the current empirical gamification literature can therefore provide no recommendations on the causal impact of leaderboards when implemented in a novel situation. Thus, a major goal of the present study is to isolate leaderboards to examine their causal effects in order to provide such recommendations.

1.2. Goal-setting theory

Goal-setting theory was originally developed by Locke (1968), who proposed that people will be motivated to strive towards goals. This approach is effective due to the psychological process of self-regulation (Latham & Locke, 1991), which acts as a mediator (i.e., intermediary causal process) between set goals and performance (Kanfer & Ackerman, 1989). Self-regulation can be defined as the modification of thought, affect, and behavior (Karoly, 1993). The goal provides the individual a measure for "excellent" performance against which to judge his or her own performance. The individual can subsequently alter his or her behavior in order to reduce the discrepancy between the performance and the goal (Latham & Locke, 1991). Goal-setting interventions are considered to be among the most powerful motivational interventions, found to be effective across many situations and tasks (Locke & Latham,

2002). When used as an intervention, leaderboards likely perform similarly to classic goal-setting interventions, because leaderboards provide the user with several potential goals. The user should be motivated to reach one of these goals and regulate his or her behavior by reducing the discrepancy between the desired goal from the leaderboard and actual performance until the given goal is met.

The effects of goal setting on self-regulation are consistent across a range of outcomes (Locke & Latham, 2002). For example, Frayne and Geringer (2000) demonstrated that job performance can be improved through self-management training, which included self-monitoring, goal-setting, and relapse prevention components. Over 12 weeks, employees were able to sustain job performance improvements when compared to the control group who received no such training. This relationship has also been observed in salespeople, where self-regulatory tactics, including goal-setting, were found to fully mediate the relationship between goal orientation and sales performance (VandeWalle, Brown, Cron, & Slocum Jr, 1999). This suggests that those who are seen as having advantageous goal orientations effectively use self-regulation to set goals and manage their performance. Similar results were found when investigating self-regulation and goal-setting among students and the effects of class performance (Lee, Sheldon, & Turban, 2003). The relationship between self-regulation and goal-setting was also supported in a comprehensive meta-analysis that explored these effects across 85 studies (113 unique samples), spanning numerous contexts, nationalities, and age groups (Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013). Together, this evidence suggests that the relationship between goal-setting and self-regulation is robust and these relationships should be expected in traditional and gamification contexts alike.

Latham and Baldes' (1975) classic logger study provides an illustrative example of how goal-setting interventions can be used to improve performance, testing Locke's (1968) original goal-setting theory. In their study, Latham and Baldes demonstrated that goal-setting was an effective method for improving the task performance of logging teams who had regularly been loading their trucks far short of their maximum capacity (approximately 60%). This was brought to the attention of management and union leaders, who agreed that a goal of 94% of the maximum capacity was a difficult but attainable goal for which the teams should strive. The loggers were paid hourly and told that the goal was part of the experiment; they would not receive any reward for meeting the goal nor would they be punished if they failed to reach it. After this goal-setting intervention, the truck weights were monitored for nine months. In the month the 94% goal was introduced, a spike in performance occurred in which the truck weights averaged just above 80% of capacity. Performance continued to climb to just above 90% of capacity, where it plateaued for the last 6 months of the study. Latham and Baldes (1975) argued that before the intervention, the loggers were essentially operating under a "do your best" goal, which when compared to the difficult, specific goal of 94% was less effective at motivating performance. In this study, the loggers monitored their own efforts in order to meet the goal, which caused the loggers to effectively utilize self-regulation.

As first seen in Latham and Baldes (1975), different goals have different effects on performance, and this has been demonstrated repeatedly in the related literature (Locke & Latham, 2002). Meta-analysis has demonstrated that there is a linear relationship between goal difficulty and performance, with estimated effect sizes ranging from $d = .52$ and $d = .82$ (Locke & Latham, 1990). From this evidence, we expect that when presented easier goals, an individual's performance will be lower than his or her performance when given more difficult goals. Given the support for specific,