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Abstract

Gamified training is a novel management control system in which companies use gamification techniques to engage and motivate employees to learn. This study empirically examines the performance consequences of gamified training by conducting a field experiment in a professional services firm. We find that the main effect of adopting the gamified training platform on performance is not statistically significant at conventional levels. However, we also find that the effect is moderated by employee engagement, such that the gamified training platform improved performance in offices with high employee engagement and worsened performance in offices with low employee engagement. In offices with high levels of employee engagement – with above-median rates of employee retention and willingness to log onto the training platform – each additional minute of average platform engagement per employee led to an additional 0.28 new clients per month. In offices with below-median rates of employee retention and willingness to log onto the training platform, each additional minute of average platform engagement per employee resulted in 0.78 fewer new clients per month. Taken together, these results suggest that gamified training, which in part, is intended to help engage and motivate employees to learn, may only yield performance benefits among those who are already highly engaged and motivated.

Preliminary and Incomplete

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1. Introduction

With advances in technology, companies are increasingly adopting novel personnel control systems to engage and motivate employees.¹ One such mechanism is gamified training; that is, incorporating game-like elements—such as performance-based points, progression through challenges and levels, instant feedback, and competition—into training activities.^{2, 3} Proponents argue that gamified training, if done well, can help engage employees in learning new concepts, developing problem-solving skills, and taking action (e.g., Kapp 2012, p. 10). However, it is also frequently criticized for distracting employees from other priorities (Yee 2006; Kuss et al. 2012).

We address this debate empirically with a field experiment in a global professional services firm that introduced a gamified training platform. This firm offers a broad array of practices in various industry sectors. The purpose of the gamified training platform was to deepen employees' awareness and understanding of the firm's value proposition to customers—highlighting its service offerings and capabilities—so that they could identify additional opportunities to generate revenue. Leaders in the firm chose to gamify the training experience to better engage employees, increasing their motivation to learn. In the training experience, employees could design their own characters and “race around the world” by answering questions about the firm's offerings. A correct answer earned travel points that enabled one to progress in the game. One could also enter “mini-game challenges” to earn points and unlock new levels (**Figure 1**).

¹ Merchant and Van der Stede (2017) define personnel control systems as “systems designed to make it more likely that employees will perform the desired tasks satisfactorily on their own because the employees are experienced, honest, and hard-working and derive a sense of self-realization and satisfaction from performing tasks well” (p. 86). They include: “selection and placement,” “training,” and “job design and provision of necessary resources.”

² Deterding, Dixon, Khaled, and Nacke (2011) define gamification as “the use of game design elements in non-game contexts.”

³ For example, Walmart introduced virtual reality to upgrade employee training at Walmart Academies nationwide. Coca-Cola uses a virtual business simulation game called Revenueopoly to help employees understand how to reach corporate strategic objectives and how to grow revenue in an ever-changing environment.

---Insert Figure 1 here ---

Our field experiment was conducted at the time the firm decided to roll out its gamified training platform in a new country in which it had 26 offices. We randomly assigned those offices into a treatment group and a control group, whereby treated offices implemented the gamified training platform starting in June 2016 and control offices waited until December 2016. Using longitudinal human resources data from the firm, our analysis spans 35 months, from the beginning of January 2015 to the end of November 2017. We leverage the randomly-staggered introduction of the training to examine the causal effects of adopting gamified training on performance and explore the conditions under which its adoption is more and less effective.

To study the overall effect of the gamified training platform, we use two identification strategies: First, we use the sample period *before* offices in the control group implemented the platform and use a conventional difference-in-differences research design to investigate whether it had an impact on the treated group. Second, leveraging the staggered implementation, we use the full sample and treat the launch of the platform as the treatment on each office, using pre-intervention offices as controls. Using four measures of performance—number of project opportunities, fees from opportunities, number of clients, and number of new clients—both methodologies provide converging evidence that the main effect of adopting the gamified training platform on firm performance is not statistically significant at conventional levels.

In our next set of analyses, we explore two conditions under which the effect may be heterogeneous; namely, (a) the level of *employee engagement*, measured by ex-ante rates of employee retention and the percentage of employees who logged onto the training platform at least once, and (b) the degree of *platform engagement*, measured by the average number of questions attempted per employee and the average number of minutes spent per employee on the platform.

First, we find that adopting the platform is associated with better firm performance in offices whose employees are more engaged. This finding suggests that the benefits of gamified training are greater if more employees are engaged with the organization and with acquiring knowledge to achieve organizational goals. Second, although we find no main effect of platform engagement on performance, we find that the effects of platform engagement on performance are moderated by employee engagement. Spending more time and effort on gamified training improves performance among highly engaged employees and worsens performance among less-engaged employees. This finding suggests that engaging already motivated employees with gamified content can be a successful strategy, but the same strategy may backfire for less-engaged employees, for whom the gamified platform may serve as a distraction from the job.

Our paper makes several contributions to the literatures on accounting, operations, and management. First, we contribute to the recent stream of work that examines the effects of gamified training systems. For example, in two studies conducted by Baxter, Holderness, and Wood (2015, 2016)—including an experiment and a field study at a bank that introduced gamified training on issues related to security and internal controls—employees report strongly preferring gamified training over non-gamified training, but report only modest increases in knowledge after taking the gamified training. Kelly, Valtchanov, and Webb (2018) show that one company’s employees increased their engagement with its online training platform and performed better in online quizzes when doing so was compensated indirectly with the right to use a virtual slot machine generating gift-card prizes rather than compensated directly with gift-card rewards (suggesting that employees find playing, and not just the gift cards, to be rewarding). We find that the effects of gamified training depend largely on employee engagement—both with the organization and with the training itself.

More generally, we contribute to the growing accounting and operations literatures on implementing digital information-sharing platforms to influence employee behaviors and performance. The literature documents positive consequences from implementing a digital information system to share creative work (Li and Sandino 2018), implementing a digital platform increasing operational transparency between employees and customers (Buell, Kim, and Tsay 2017), and providing online training (Fisher, Gallino, and Netessine 2017). Our study examines the effect of implementing a *gamified* digital training platform in a professional services firm.

Finally, our study adds to the recent literature highlighting that management control systems do not work in isolation (e.g., Grabner and Moers 2013). We find that employee engagement, which could be the outcome of other control systems such as results control systems (that is, pay-for-performance systems) and cultural control systems, can moderate the effectiveness of a personnel control system such as gamified training.⁴

The paper continues as follows. Section 2 develops our hypotheses. Section 3 describes the field experiment. Section 4 presents our research design and findings. Section 5 concludes.

2. Related Literature and Hypothesis Development

2.1. Effects of Gamified Training

Advances in technology offer companies increasingly innovative means to motivate employee performance. While traditional management control systems emphasize the role of extrinsic rewards (for example, the design of pay-for-performance contracts), firms are

⁴ Merchant and Van der Stede's (2017) definition of personnel control systems was provided in footnote 1, page 1. They define results controls as those that involve "rewarding employees for generating good results" (p. 33) and cultural controls as those that exist "to shape organizational behavioral norms and to encourage employees to monitor and influence each other's behaviors" (p. 86).

increasingly trying to enhance intrinsic motivation. One example is gamification, which aims to make learning enjoyable in its own right. Home Depot introduced a mobile gamification app called “the PocketGuide,” which uses gamification techniques to train new employees while they are on the job.⁵ The company believes that gamification can enhance employees’ learning experience and thus reinforce training. Despite the prevalent use of gamified training, only a few academic studies have examined its effects. We contribute to this emerging literature by conducting a field experiment in a global professional services company.

It is unclear whether or not a gamified training platform should yield a positive performance outcome. On the one hand, research suggests an improvement in employee satisfaction when work tasks are perceived as “play” (Csikszentmihalyi and LeFevre 1989; Sansone, Sachau, and Weir 1989). Gamified training should therefore energize workers’ dedication to the content of the training because such behavior is associated with pleasure. Some studies examine the motivational consequences of gamified training. For instance, Baxter et al. (2015) show that a gamified version of IT security training results in greater trainee satisfaction than a non-gamified version does. Moreover, Kelly et al. (2018) study employees’ engagement in an online training platform which rewards training completion either via gift cards or via a virtual slot machine (which, in turn, translates into gift cards). The authors find greater training engagement and performance amongst employees using the virtual slot machine, suggesting that they derive satisfaction from playing. Only a handful of studies have examined the effects of gamified training on employee performance. Baxter et al. (2015, 2016) report results from a study at a bank in which they examine the effects of one-time gamified trainings on increases in employee knowledge. They find the gamified training associated with only modest improvements

⁵ <https://corporate.homedepot.com/newsroom/onboarding-go-mobile-application-enhances-associate-training>.

in learning, driven by the least experienced employees (who had more to learn). Ramirez (2017) shows that truck drivers improve their driving efficiency (measured as fuel used per distance travelled) both during and after a gamified online training paired with personal coaching that compares their driving performance to that of their peers. Ramirez (2017) also finds, however, that the online tool's effectiveness lasts only a short while (while the system is novel).

On the other hand, gamified training may distract employees' attention from more important tasks. The literature has shown some evidence that games can be "addictive" for some individuals (e.g., Yee 2006; Kuss et al. 2012). Despite the benefit of increased enthusiasm for the training process, the high attractiveness of gamification features may result in employees' "immersion" in the game. Kuss et al. (2012) suggest that introducing gamified components into the business environment may cause employees to feel detached from their real tasks, potentially undermining performance. The fundamental insight from these studies is that gamified training might bring unintended negative consequences if employees are overly distracted by it.

In collaboration with our field research partner, we use a staggered implementation approach to conduct a randomized field experiment that tests the effect of gamified training on performance. The conflicting arguments described above suggest that the platform may either increase or decrease employee's performance. Therefore, we split our first hypothesis as follows:

Hypothesis 1A (H1A): The introduction of a gamified training platform will have a positive effect on performance.

Hypothesis 1B (H1B): The introduction of a gamified training platform will have a negative effect on performance.

2.2. Conditions Influencing the Efficacy of Gamified Training

We focus on two potential moderators of the effect of gamified training on firm performance: (a) *employee engagement* (how engaged employees are in their work) and (b) *platform engagement* (how much time and effort employees spend engaging with the gamified training platform). We next review the relevant literature and develop hypotheses regarding how these factors may influence the effect of gamified training on performance.

2.2.1. Gamified Training and Employee Engagement

Employee engagement has gained widespread attention in academia (e.g., Kahn 1990; Saks 2006; Rich, Lepine, and Crawford 2010). Kahn (1990) defines engagement as “the harnessing of organization members’ selves to their work roles; in engagement, people employ and express themselves physically, cognitively and emotionally during role performance” (p. 694). One stream of literature examines the antecedents of employee engagement in the field using survey data (e.g., Saks 2006; Rich et al. 2010). These studies show greater engagement among employees whose jobs require a greater variety of skills, involve a complete piece of work, are perceived to be important, or offer greater autonomy and feedback (Hackman and Oldham 1980; Saks 2006). They also show that perceived organizational support and the individual’s alignment with organizational values and goals are positively associated with employee engagement (Saks 2006, Rich et al. 2010). Another strand of literature studies the consequences of employee engagement and shows that it is positively associated with job satisfaction and negatively associated with intention to quit (e.g., Sonnentag 2003; Schaufeli and Bakker 2004; Saks 2006).

Research further suggests that management control systems do not work in isolation (e.g., Grabner and Moers 2013). We expect the employee engagement generated through other controls

(e.g., results or cultural controls used to increase employee alignment with organizational values and goals) to increase an employee's willingness to productively engage with a personnel control system like gamified training. In particular, an employee's level of engagement is likely to determine whether she uses the gamified training to improve at a job in which she is profoundly invested or to take a break from a job in which she is not invested. It follows that employee engagement should moderate the effect of gamified training on performance. We therefore hypothesize:

Hypothesis 2 (H2): The introduction of a gamified training platform will be more beneficial when employees are more engaged.

2.2.2. Gamified Training and Platform Engagement

Gamified training can be viewed as a human-capital investment that consists of imparting knowledge, providing immediate feedback, and enabling employees to compare their achievements with those of their peers—all in a fun and engaging way (Cardador, Northcraft, and Whicker 2017). The more effort employees put into the gamified training platform, the more knowledge they gain from it and the better the performance outcomes should be.

However, employees have limited information-processing capability. Therefore, the more time and attention they devote to the gamified training, the more likely they are to be distracted from their main tasks. Given the unclear moderating effect that platform engagement may have on the relationship between gamified training and performance, we split our third hypothesis as follows:

Hypothesis 3A (H3A): The introduction of a gamified training platform will be more beneficial when employees engage more intensely with the platform.

Hypothesis 3B (H3B): The introduction of a gamified training platform will be less beneficial when employees engage more intensely with the platform.

3. Research Setting and Data

The research site for this study is a global professional services company (hereafter, “PSC”). PSC offers a broad array of practices in various industry sectors across three main lines of service and has more than 300 offices worldwide.⁶ Due to its size and complexity, PSC faced a challenge in which employees lacked a detailed awareness and understanding of the core services the firm aimed to provide. Because such an understanding was crucial to long-term success—owing to the consultative selling process PSC uses to cultivate business—the company decided to create and deploy a gamified training platform to provide employees with the knowledge and confidence necessary to make PSC’s service capabilities more fully available to its clients and potential clients.

3.1. Gamified Training Platform

To improve employee engagement in the training, PSC created a gamified learning tool that uses game elements to provide information about its service offerings. Employees choose a game character and immerse themselves in a virtual world in which they can travel to different places where they explore different themes. They can voluntarily participate in the gamified platform using one of four modes: single-player game mode, mini-game mode, quiz mode, or tournament mode. Along this virtual journey, they are asked questions about the firm’s service capabilities and can earn points for correct answers. Wrong answers result in instant feedback and a detailed explanation. The questions become more difficult as one progresses through the game.

⁶ We do not provide detailed figures on the size and scope of the company to preserve its anonymity, but highlight that it is large.

The gamified experience is enhanced by incorporating options to unlock new locations and to complete missions. At the end of the game, one's performance is summarized on a global leaderboard that contains one's rank and learning progress. Figure 1 shows screenshots of the gamified training tool.

We partnered with PSC to develop a field experiment examining the effect of implementing its gamified training platform on performance. In several ways, this research site provided us with an attractive setting in which to examine the performance consequences of gamified training. First, prior studies on the effect of training or other management control systems generally cannot measure employee engagement in the initiative since employee effort is usually unobservable. Our study overcomes this limitation by exploiting the gamified format to directly measure how much effort employees put into the training. Specifically, we keep track of the amount of time participants spent on the platform and how many questions they answered. Moreover, in collaboration with PSC, we can augment this game-play data with broader measures of engagement, such as employee retention rate and office-level willingness to log onto the platform, affording a deeper understanding of employee engagement both on and off the training platform.

Second, our research setting allows us to study the effect of gamified training on outcomes that can be closely linked with the training content. In particular, the highly consultative selling process of a professional services firm relies on its associates' knowledge and skill to identify and seize engagement opportunities. We use granular data from PSC's client management system to measure the effect of gamified training on treated associates. Moreover, we use (a) office-level fixed effects to account for time-invariant unobservable factors that may contribute to performance differences among offices and (b) time-based fixed effects to account for office-invariant factors

that differ over time, allowing a clearer view of the platform's effects on performance. Our outcome variables are fully defined in Section 3.3.

Third, the highly customized, client-centric nature of work in a professional services context is characterized by a high degree of employee discretion over how time is allocated, discretion that creates variation we exploit in our analysis. In retail or logistics, for example, where gamified training's effects have also been tested, roles and daily responsibilities tend to be much more standardized.

Finally, prior studies on training or other management control systems may be subject to endogeneity problems. For instance, some studies (Birley and Westhead 1990; Deng, Menguc, and Benson 2003) find that training is negatively related to employee productivity, attributing the result to training ineffectiveness. However, this finding may be due to reverse causality in that organizations with performance problems are more inclined to provide more training in the hope of improving performance. Our field experiment, whereby we randomly assign employees to treated and control groups, enables us to more convincingly draw conclusions with respect to causality than would be the case in a cross-sectional regression study.

3.2. Description of the Experiment

We partnered with PSC to conduct a field experiment in a country in the Americas. This country was chosen by PSC to participate in the experiment due to the relatively large number of offices it had there, which allowed us to collect enough data to conduct analyses with sufficient power to draw meaningful conclusions. Figure 2 shows the timeline of the field experiment. Twenty-six offices participated. In the pre-intervention period (before June 2016), offices were randomly divided into a treatment group of 16 and a control group of 10. For each office, we

collected data on client opportunities pursued and the revenue related to those opportunities. The company rolled out the gamified training platform to the treatment group in a staggered fashion from June 2016 through November 2016. For each office, the gamified training platform was made available to all staff at all levels. In December 2016, the company implemented the platform for the control group. In the post-intervention period, we continued to collect data on opportunities and their related revenue in both the treatment group and the control group for 12 months, through November 2017.

--- Insert Figure 2 here ---

Our sample includes monthly office-level data from January 2015 through November 2017, resulting in 782 office-month observations. For each month in the sample period, we collected information on new opportunities generated by each office. In addition, we obtained data on use of the gamified training platform and additional data on the personnel in each office. With this data, we can analyze the effect of the adoption of the gamified training platform on opportunities and their related revenue. A detailed description of the variables of interest is provided below.

3.3. Variables of Interest

3.3.1. Dependent Variables

Our main variable of interest is firm performance, which we measure using four variables: *Fees from Opportunities* $_{i,t}$ is the fees collected by office i in month t ; *# Opportunities* $_{i,t}$ is the number of opportunities generated by office i in month t ; *# Clients* $_{i,t}$ is the number of clients served by office i in month t , and *# New Clients* $_{i,t}$ is the number of new clients served by office i in month t . All four capture data on opportunities, which PCS uses to assess its performance. Table 1

provides descriptive statistics on the firm performance variables. Annually, an average office collected \$3.88 million USD in fees and generated 57 opportunities from an average of 51 clients, 23 of which were new.

--- Insert Table 1 here ---

3.3.2. Measures of Employee Engagement

We use three proxies to measure employee engagement. Prior studies find that engagement is negatively related to intention to quit (Schaufeli and Bakker 2004; Saks 2006); the fundamental insight is that turnover can indicate employee engagement. Our first proxy for employee engagement is therefore *Pre-period Monthly Retention Rate_i*, which is the average monthly retention rate in office *i* in the pre-intervention period, measured as 1 minus the number of monthly employee defections in an office divided by the total number of people employed by the office during the month. We assume that a higher rate indicates higher employee engagement. Our second proxy for employee engagement is *Willingness to Log On_i*, the percentage of employees who logged onto the training platform at least once in office *i*. We denote this as a measure of employee engagement (rather than platform engagement), since it captures evidence of the first instance of platform access, before interaction with the platform itself has had a chance to influence employee behavior. As such, offices exhibiting a higher percentage of employees exhibiting a willingness to log onto the gamified training platform offer evidence of a higher level of employee engagement with firm initiatives. We further note that there's considerable variability in this metric across offices, with a maximum rate of 70.45%, suggesting that logging on was discretionary, even in offices with the highest levels of adoption (Table 1). Our third proxy for employee engagement, *High Engagement_i*, is an aggregated measure of retention rate and willingness to log onto the training platform; it is a dummy variable equal to 1 if both *Pre-period Monthly Retention Rate* and

Willingness to Log On are above median. Reflective of the relatively small size of offices (the median office had 47 employees), and generally high employee loyalty, office-level retention ranged from a low of 83.65% to a high of 100.00% during the 18-month pre-intervention period, with a median pre-period retention rate of 99.15%. The median willingness to log onto the gamified training platform was 18.18%. Importantly, the platform that is the focus of our study was designed and used not as a tool for onboarding new employees, but rather to broaden the familiarity of the firm's highly-specialized associates with its diverse service offerings. Consistently, the correlation matrix shown in Table 2 demonstrates that *Pre-period Monthly Retention Rate* is positively associated with *Willingness to Log On* (0.2473; $p < 0.01$), which aligns with our assertion that these two metrics are positively associated with employee engagement.

--- Insert Table 2 here ---

3.3.3. Measures of Platform Engagement

One advantage of this research setting is that we can measure employee inputs by exploiting the gamified format of the training. This allows us to use two proxies for how engaged employees are in the gamified training platform: *Time Spent on Training_i*, the average amount of active participation time on the platform per employee in office *i*, and *# Questions Answered_i*, the average number of questions answered per employee in office *i*. We validate these measures in Table 2. The correlation matrix shows that *Time Spent on Training_i* is positively associated with *# Questions Answered_i* (0.9621, $p < 0.01$), suggesting that these measures move together – more time spent on the platform is consistent with more time engaged in the activity of answering questions.

3.4. Covariate Balance

Using a field experiment allows us to draw strong causal inferences about the effects of our treatment (the introduction of gamified training) on our dependent measures of performance, since the treatment offices were selected randomly. To further investigate the robustness of the randomization, we conduct a covariate balance analysis to ensure that treatment and control offices are similar in the pre-intervention period. We compare the values of the primary focal variables across the treatment and control groups three months prior to the intervention, which we report in Table 3. There are no statistically significant differences in number of opportunities, number of existing clients, number of new clients, or number of new employees. The only statistically significant difference that we observe is in the fees collected, which are significantly larger in the treatment group than in the control group. This is not a significant concern since our analyses control for office fixed effects. In general, the assumption that there is no failure in random assignment appears sufficiently satisfied.

--- Insert Table 3 here ---

4. Empirical Research Design and Results

4.1. The Effects of Gamified Training (H1)

To test our first pair of hypotheses, we use two identification strategies. The first focuses on the period *before* offices in the control group started to implement the gamified training platform (January 2015 through November 2016). We use a conventional difference-in-differences research design to investigate whether the introduction of the gamified training platform had an impact on the performance of employees in the treatment group, relative to the performance of

employees in the control group, who did not receive access to the platform. We estimate the following model:

$$\begin{aligned}
 Outcome_{i,t} = & \alpha + \beta_1 Post_t \times Treated_i + \beta_2 Office\ Size_{i,t} \\
 & + Office\ Fixed\ Effects_i + Month\ Fixed\ Effects_t + \varepsilon_{i,t},
 \end{aligned} \tag{1}$$

where $Outcome_{i,t}$ is measured using the four dependent variables described in Section 3.3.1, except that we use the natural logarithm of fees collected because the absolute amount exhibits a right-skewed distribution. $Post_t$ is a dummy variable equal to 1 for all months after the month of implementation of the gamified training platform. $Treated_i$ is a dummy variable equal to 1 if the office is assigned to the treatment group. We control for time-variant firm size by adding $\# New\ Employees_{i,t}$ (the number of new employees in office i in month t). All estimations include month fixed effects and office fixed effects and standard errors are clustered at the office level. Month fixed effects allow us to control for the seasonality of the company's business operations and for relevant distinctions between pre and post periods; office fixed effects allow us to control for time-invariant office-level characteristics. Since $Post$ and $Treated$ are subsumed by the inclusion of month and office fixed effects, we exclude them from the model. The interaction between $Post$ and $Treated$ is our variable of interest, which captures the average treatment effect of the gamified training platform on the outcome variables. We provide detailed variable definitions in the Appendix.

Our second identification strategy is to exploit the platform's staggered implementation, treating the launch of the gamified training platform as the treatment introduction for each office and using offices that remain in a pre-intervention state as our control group. The advantage of this strategy is that we can use the full sample of data, which allows us to observe the performance

effect of the gamified training platform a full 12 months after implementation. We estimate the following model:

$$\begin{aligned} Outcome_{i,t} = & \alpha + \beta_1 Post_t + \beta_2 Office\ Size_{i,t} \\ & + Office\ Fixed\ Effects + Month\ Fixed\ Effects + \varepsilon_{i,t}, \end{aligned} \quad (2)$$

where $Outcome_{i,t}$ is measured using the four dependent variables described in Model (1) and $Post_t$ is a dummy variable equal to 1 for all months after the month of implementation. Again, we control for $\# New\ Employees_{i,t}$, all estimations include month and office fixed effects, and standard errors are clustered at the office level. Our main variable of interest is $Post_t$, which captures the average treatment effect of the gamified training platform on the outcome variables.

Table 4 provides the results of our tests for H1. Panels A and B report the results based on Models (1) and (2), respectively. Results of both specifications are inconsistent with H1A and H1B: platform adoption had no statistically significant effect on any of the outcome variables. To address the parallel trend assumption that trends among treated and control offices would be identical in the absence of treatment, we repeat Model (1) in Panel A of Table 4 with separate monthly time trends for treated and control offices. These results, presented in Figure 3, are also consistent with those of the main models, supporting the assumption of parallel trends.

--- Insert Figure 3 here ---

A potential explanation for these findings is the possibility of significant cross-sectional variation with respect to the effect of the gamified training platform. In other words, the average effect of gamified training may be positive in some offices, but negative in others. We next analyze the conditions under which gamified training may be more or less effective.

--- Insert Table 4 here ---

4.2. Moderators of the Effectiveness of Gamified Training (H2 and H3)

To test our second and third hypotheses, we extend Model (2) as follows:⁷

$$\begin{aligned} Outcome_{i,t} = & \alpha + \beta_1 Post_t \times Condition_i + \beta_2 Post_t + \beta_3 Office Size_{i,t} + \\ & Office Fixed Effects + Month Fixed Effects + \varepsilon_{i,t}, \end{aligned} \quad (3)$$

where $Outcome_{i,t}$ is measured using the four dependent variables described in Model (1), $Post_t$ is a dummy variable equal to 1 for all months after the month of implementation, and $Condition_i$ refers to measures of employee engagement (*Pre-period Monthly Retention Rate*, *Willingness to Log On*, and *High Engagement*) to test H2 and refers to measures of platform engagement (*Time Spent on Training* and *# Questions Answered*) to test H3. As in previous specifications, we control for $\# New Employees_{i,t}$ and month and office fixed effects and cluster standard errors at the office level. The interaction between $Post$ and $Condition$ is our variable of interest.

4.2.1. The Moderating Effect of Employee Engagement (H2)

In this section, we test H2 by exploring the moderating effect of employee engagement on the relationship between gamified training and performance. As described in Section 3.3, we use three measures of employee engagement: average monthly retention rate in the pre-intervention period, willingness to log onto the gamified training platform, and high engagement, which is an aggregated measure of the other two.

Table 5 reports results examining the moderating effect of our first employee engagement proxy (average retention rate in the pre-intervention period) on the relationship between the gamified training and office-level performance. Consistent with H2, we find that the coefficients

⁷ We use Model (2) rather than Model (1) in this section because our data on the gamified training platform (*Willingness to log On*, *Time Spent on Training*, and *# Questions Answered*) is a one-time cumulative set of data through November 2017. These are not accurate proxies for employees' input on the gamified training platform for the subsample period based on which we construct Model (1), which ends at the end of November 2016.

on *Post × Pre-period Monthly Retention Rate* are significantly positive across all outcome variables. Specifically, for every 0.2% increase in the monthly retention rate (roughly a one-standard-deviation increase) during the pre-intervention period, the introduction of the gamified training platform will increase fees collected by 19.7% (calculated as $e^{(89.9*0.002)}-1$), the number of opportunities generated by 5.7 (coefficient=2863.669; $p<0.05$), the number of clients by 5.6 (coefficient=2794.249; $p<0.01$), and the number of new clients by 3 (coefficient=1549.666; $p<0.10$), relative to the differences manifested in other offices that implemented the gamified training platform.

--- Insert Table 5 here ---

Table 6 presents the moderating effects of our second employee engagement proxy (willingness to log onto the platform) on the performance effects of the gamified training platform. The coefficients on *Post × Willingness to Log On* are positively associated with # *Opportunities*, # *Clients*, and # *New Clients*, which means that for every 18% increase in an office's willingness to log onto the platform (roughly a one-standard-deviation increase), the platform's introduction will be associated with 3.5 more new opportunities (coefficient=19.453; $p<0.10$), 3.4 more clients (coefficient=18.855; $p<0.05$), and 3 more new clients (coefficient=16.395; $p<0.05$) per month, relative to the differences observed among other offices that implemented the platform.

--- Insert Table 6 here ---

Table 7 presents the moderating effects of our third employee engagement proxy (high engagement) on the performance effects of the gamified training platform. The coefficients on *Post × High Engagement* are positively associated with # *Opportunities*, # *Clients*, and # *New Clients*, which means that the introduction of gamified training in offices with high employee engagement led to 8.81 more opportunities surfaced per month (coefficient=8.805; $p<0.05$) than

in offices where it was introduced with low employee engagement, as well as 9.19 more client engagements per month (coefficient=9.191; $p < 0.05$), and 6.45 new clients cultivated per month (coefficient=6.451; $p < 0.10$) in the year following its introduction.

--- Insert Table 7 here ---

Taken together, our findings support our second hypothesis, suggesting that employee engagement is a performance enabler when introducing gamified training. Gamified training is most beneficial when the recipients are already engaged with the organization. Our results further suggest that gamified training is not a panacea for disengaged workers. Indeed, in offices with low employee engagement, it generally corresponded with a performance *decline*.

4.2.2. The Moderating Effect of Platform Engagement (H3)

In this section, we test H3A and H3B by exploring the moderating effect of platform engagement on the relationship between gamified training and employee performance. As described in Section 3.3, we use two measures of platform engagement: average amount of active time per employee on the gamified training platform (*Time Spent on Training*) and average number of questions answered per employee (*# Questions Answered*).

The results from our moderation tests based on platform engagement are reported in Table 8. Platform engagement is measured by *Time Spent on Training* in Columns 1–4 and by *# Questions Answered* in Columns 5–8. Across all columns, the coefficients on *Post* × *Platform Engagement* are insignificant, suggesting that platform engagement has no effect on organizational performance. One possible explanation is that the positive effect of platform engagement at some offices was cancelled out by a negative effect at others. To further explore this possibility, we next analyze whether the effect of platform engagement depends on the level of employee engagement.

--- Insert Table 8 here ---

4.3. Interaction Analysis between Employee Engagement and Platform Engagement

In Section 4.2, we find that platform engagement, on average, has no significant effect on organizational performance. To better understand the conditions under which platform engagement does have an impact on office-level performance, we further examine the interaction effect between employee engagement and platform engagement. We estimate the following model:

$$\begin{aligned} Outcome_{i,t} = & \alpha + \beta_1 Post_t \times Platform\ Engagement_i \times High\ Employee\ Engagement_i + \\ & \beta_2 Post_t \times Platform\ Engagement_i + \beta_3 Post_t \times High\ Employee\ Engagement_i + \beta_4 Post_t + \\ & \beta_5 Office\ Size_{i,t} + Office\ Fixed\ Effects + Month\ Fixed\ Effects + \varepsilon_i, \end{aligned} \quad (4)$$

where $Post_t \times Platform\ Engagement_i \times High\ Employee\ Engagement_i$ captures the interaction effect between platform engagement and employee engagement. If the effect of platform engagement on performance is positively moderated by employee engagement, then we expect β_1 to be positive.

We use three measures of high employee engagement: *High Retention Rate* is a dummy variable equal to 1 if the office's average retention rate in the pre-intervention period is above median. *High Willingness to Log On* is a dummy variable equal to 1 if the office's percentage of employees who logged onto the training platform is above median. *High Engagement* is a dummy variable equal to 1 if both are above median.

Table 9 reports results examining the interaction effect between our first employee engagement proxy (*High Retention Rate*, or above-median average retention rate in the pre-intervention period) and platform engagement. We find the interaction term positively associated with number of opportunities, number of clients, and number of new clients when platform engagement is measured both by average amount of active time on the gamified training platform

and by average number of questions answered. In offices in which employee engagement was high to begin with, deepened engagement with the platform led to marginal improvements in performance, with every additional minute of average platform engagement per employee leading to an additional 0.14 opportunities, 0.13 clients, and 0.33 new clients every month and with every additional question answered leading to an additional 0.04 opportunities, 0.04 clients, and 0.09 new clients every month. In offices with a below-median retention rate, however, each subsequent minute of average platform engagement per employee resulted in 1.37 fewer monthly opportunities (coefficient=-1.369; $p<0.01$), 1.18 fewer clients (coefficient=-1.183; $p<0.01$), and 0.78 fewer new clients per month (coefficient=-0.784; $p<0.01$) and each subsequent question answered resulted in 0.45 fewer opportunities (coefficient=-0.450; $p<0.01$), 0.40 fewer clients (coefficient=-0.395; $p<0.01$), and 0.25 fewer new clients (coefficient=-0.253; $p<0.05$).

--- Insert Table 9 here ---

Table 10 shows results examining the interaction effect between our second employee engagement proxy (*High Willingness to Log On*, or above-median willingness to log onto the gamified training platform) and platform engagement. In offices with high employee engagement, deepened engagement with the platform led to marginal improvements in performance, with every additional minute of average platform engagement per employee leading to an additional 0.05 opportunities, 0.12 clients, and 0.23 new clients every month and with every additional question answered leading to an additional 0.02 opportunities, 0.04 clients, and 0.06 new clients every month.⁸ In offices with below-median willingness to log on, however, each subsequent minute of average platform engagement per employee resulted in 1.41 fewer monthly opportunities (coefficient=-1.407; $p<0.01$), 1.27 fewer clients (coefficient=-1.268; $p<0.01$), and 0.82 fewer new

⁸ Post-estimation tests suggest that these effects are significant at the 0.05 level.

clients (coefficient=-0.822; $p<0.01$) per month and each subsequent question answered resulted in 0.53 fewer opportunities (coefficient=-0.531; $p<0.01$), 0.48 fewer clients (coefficient=-0.482; $p<0.01$), and 0.33 fewer new clients (coefficient=-0.332; $p<0.01$).

--- Insert Table 10 here ---

Table 11 presents results from the interaction effect between our third employee engagement proxy (*High Engagement*, or above-median average retention rate in the pre-intervention period and above-median willingness to log onto the gamified training platform) and platform engagement. We find that in offices with high employee engagement, deepened engagement with the platform led to marginal improvements in performance, with every additional minute of average platform engagement per employee leading to an additional 0.28 new clients every month and with every additional question answered leading to an additional 0.07 new clients every month.⁹ However, in offices with low employee engagement, each subsequent minute of average platform engagement per employee resulted in 1.41 fewer monthly opportunities (coefficient=-1.409; $p<0.01$), 1.26 fewer clients (coefficient=-1.263; $p<0.01$), and 0.78 fewer new clients per month (coefficient=-0.780; $p<0.01$) and each subsequent question answered resulted in 0.46 fewer opportunities (coefficient=-0.462; $p<0.01$), 0.43 fewer clients (coefficient=-0.426; $p<0.01$), and 0.25 fewer new clients (coefficient=-0.252; $p<0.05$).

--- Insert Table 11 here ---

Taken together, our findings suggest that the impact of platform engagement on organizational performance depends on the level of employee engagement in the offices in which gamified training is introduced. If employee engagement is low, gamified training is associated

⁹ Post-estimation test suggests that these effects are significant at the 0.01 level.

with worse firm performance in offices where employees are *more* engaged in it. If employee engagement is high, gamified training is associated with better firm performance in offices where employees are more engaged in it. These results again shed light on the important role of employee engagement.

5. Conclusion

Gamified training has been widely used to engage and motivate employees to learn, but research examining its effectiveness in improving organizational performance is scant, largely because observational data are scarce. Although the idea of gamified training may be intuitively appealing, its effects on organizational performance are not necessarily obvious. On the one hand, it may motivate employees to engage more deeply in learning content helpful to performance. On the other hand, it may motivate employees to engage more deeply in playing a game without engendering the intended learning, which may have at best no impact on performance but, at worst, a negative impact if playing the game distracts employees from their work.

To study this empirical question, we partnered with a large professional services firm that was adopting a gamified training platform. We conducted a field experiment to examine the platform's impact on measures of monthly performance that are consequential to the organization: fees, opportunities surfaced, clients served, and new clients cultivated. Although we find no overall effect of gamified training on performance, the staggered introduction of the training in different offices enables us to examine heterogeneous treatment effects—circumstances under which the introduction of gamified training might be more or less effective.

In particular, we explore two potential moderators of the effectiveness of gamified training on performance: (a) *employee engagement* (how engaged employees are in their jobs, measured

by ex-ante rates of employee retention and the percentage of employees who logged onto the training platform at least once) and (b) *platform engagement* (how engaged employees are in the gamified training platform, measured by the average number of questions attempted per employee and the average number of minutes spent per employee on the platform). We find that both measures of employee engagement – measured in terms of employee retention and the proportion who log on to the training platform – positively moderate the impact of gamified training on performance. Controlling for other factors, introducing gamified training in offices with high rather than low aggregated employee engagement led to 8.81 more opportunities surfaced, 9.19 more client engagements, and 6.45 new clients per month over the following year.

Moreover, although we find that platform engagement—measured in terms of both the number of questions answered on the platform and the time spent on the platform—has no average effect on organizational performance, we find that the impact in a given office depends on its level of employee engagement. Where employee engagement was high to begin with, deepened engagement with the platform led to marginal improvements in performance, with every additional minute of average platform engagement per employee leading to an additional 0.28 new clients per month. But that doesn't mean that gamified training is a panacea for disengaged employees. In offices with below-median retention and below-median willingness to log onto the platform, each subsequent minute of average platform engagement per employee resulted in 1.41 fewer opportunities, 1.26 fewer clients, and 0.78 fewer new clients per month.

This study is subject to several limitations. Despite the advantages of using a field experiment to examine the performance consequences of adopting a gamified training platform, our findings are based on archival data from a single company, which may hinder their generalizability to other settings. However, the professional services firm we analyze has much in

common with a broad class of service organizations whose employees are provided with information about the company's portfolio of offerings and are encouraged to consultatively sell services to existing and potential clients. Moreover, although we analyze a set of conditions that may moderate the relationship between gamified training and performance, this set is by no means exhaustive and we encourage future researchers to study other possible moderators, such as corporate culture.

Despite these limitations, we believe our study yields relevant insights, in particular by highlighting how gamified training can have contingent effects on performance that hinge on the levels of employee engagement. Our study is one of the first to research the contingent effects of this novel personnel-management-control system that is widely used but insufficiently studied.

Our results contribute to a deeper understanding of the circumstances under which gamified training can help and hinder performance. In particular, they suggest that using gamification can motivate highly engaged employees to train harder in order to boost improvement, but may undermine the performance of employees who are disengaged in the first place.

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Appendix
Definitions of Variables

Variable	Description
<i>Fees from Opportunities_{i,t}</i>	Fees in office <i>i</i> in month <i>t</i>
<i># Opportunities_{i,t}</i>	Number of opportunities in office <i>i</i> in month <i>t</i>
<i># Clients_{i,t}</i>	Number of clients in office <i>i</i> in month <i>t</i>
<i># New Clients_{i,t}</i>	Number of new clients in office <i>i</i> in month <i>t</i>
<i># New Employees_{i,t}</i>	Number of new employees in office <i>i</i> in month <i>t</i>
<i>Pre-period Monthly Retention Rate_i</i>	Average retention rate in office <i>i</i> in the pre-intervention period
<i>Willingness to Log On_i</i>	Percentage of employees who logged onto the training platform at least once in office <i>i</i> through November 2017
<i>Time Spent on Training_i</i>	Average amount of active time in training per employee in office <i>i</i> as of June 2018
<i># Questions Answered_i</i>	Average number of questions answered per employee in office <i>i</i> as of November 2017
<i>Platform Engagement_i</i>	1) <i>Time Spent on Training</i> ; 2) <i># Questions Answered</i>

Figure 1: Screenshots of Gamified Training Platform

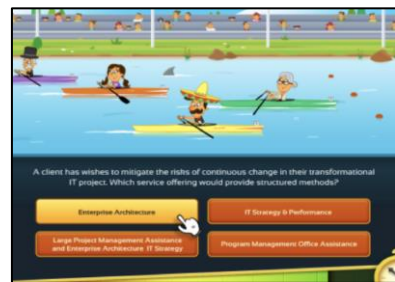
A. Employees design their characters and compete by quickly answering questions about the firm and its offerings.



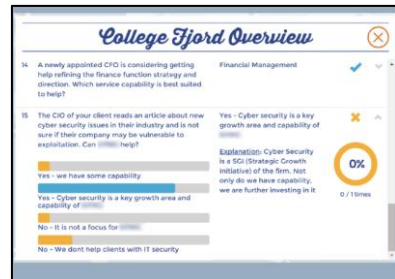
B. Employees unlock locations with new challenges as they progress through the experience.



C. The platform uses five quiz modes to engage users throughout the experience.



D. Along the way, employees can review the correct answers to questions they missed and see how others responded to those questions.



E. A scoring system and leaderboard allow employees to track their progress and compare their performance to that of others.

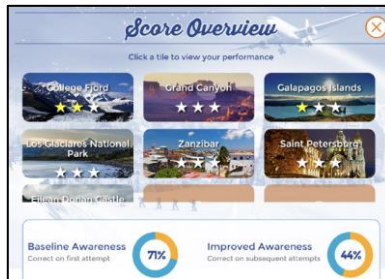


Figure 2: Timeline of Field Experiment

Figure 2 illustrates the schedule of the field experiment testing the effects of a gamified training platform.

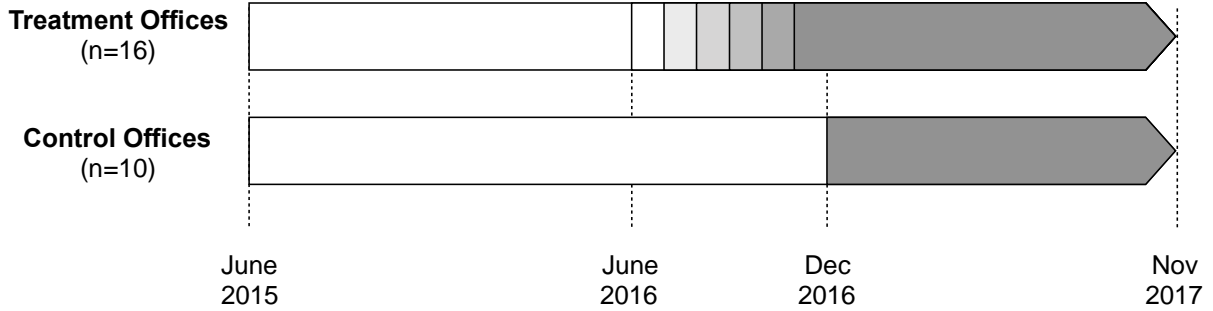


Figure 3: Plot of Coefficient for Monthly Interaction with Treatment

Figure 3 graphically reports the results from OLS regressions of Model (1) by plotting the coefficients with the corresponding 95% confidence intervals of the interactions between treatment and each month in the 12-month period. *Treated* is a dummy variable equal to 1 if the office implemented gamified training before December 2016 and equal to 0 if it did so in December 2016. All other variables are defined in the Appendix.

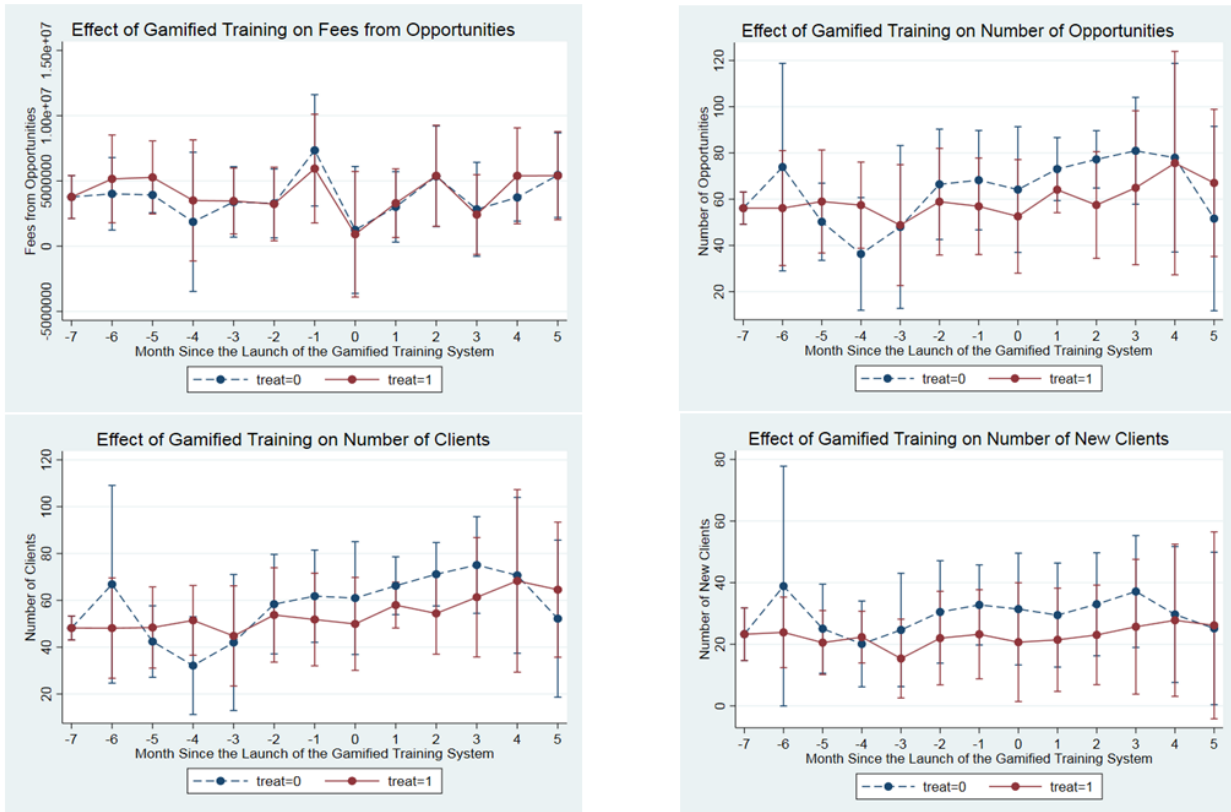


Table 1: Descriptive Statistics

Table 1 summarizes the characteristics of the sample of offices at the office-year level. All variables are defined in the Appendix.

	Count	Mean	Median	Sd	Min	P25	P75	Max
<i>Fees from Opportunities</i>	782	3880644	276015	1.23e+07	0	95500	914184	9.36e+07
<i># Opportunities</i>	782	57.35806	25	108.2128	1	13	45	695
<i># Clients</i>	782	50.53453	23	91.37558	1	11	41	568
<i># New Clients</i>	782	22.95013	12	35.73822	0	5	26	283
<i># New Employees</i>	782	3.654731	0	12.72062	0	0	2	143
<i>Pre-period Monthly Retention Rate</i>	781	.9985719	.9995238	.002186	.9901297	.997807	1	1
<i>Willingness to Log On</i>	782	.2485836	.1818182	.1799077	.0211268	.1462094	.2727273	.7045454
<i>Time Spent on Training</i>	782	6.325011	2.933333	7.805006	0	1.411765	8.749999	30.87004
<i># Questions Answered</i>	782	25.08873	13.44709	28.77553	0	5.30303	33.00398	116.1756

Table 2: Correlation Matrix

Table 2 reports the correlation matrix for the variables defined in the Appendix. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

	1	2	3	4	5	6	7	8	9
<i>1. Ln(Fees from Opportunities)</i>	1.0000								
<i>2. # Opportunities</i>	0.6721***	1.0000							
<i>3. # Clients</i>	0.6763***	0.9986***	1.0000						
<i>4. # New Clients</i>	0.5654***	0.8249***	0.8335***	1.0000					
<i>5. # New Employees</i>	0.4780***	0.6952***	0.6919***	0.5231***	1.0000				
<i>6. Pre-period Monthly Retention Rate</i>	0.0079	-0.0043	-0.0143	-0.1318***	0.0467	1.0000			
<i>7. Willingness to Log On</i>	-0.1316***	-0.1539***	-0.1481***	-0.1205***	-0.1131***	0.2473***	1.0000		
<i>8. Time Spent on Training</i>	-0.0396	-0.0887**	-0.0750**	0.0308	-0.1093***	-0.2822***	0.6242***	1.0000	
<i>9. # Questions Answered</i>	-0.0334	-0.1001***	-0.0870**	0.0029	-0.1100***	-0.1146***	0.7438***	0.9668***	1.0000

Table 3: Covariate Balance

Table 3 reports covariate balance between *Treated* and *Control* offices for all main variables three months before the launch of gamified training. *Treated* refers to offices that implemented gamified training before December 2016. *Control* refers to offices that did so in December 2016. All other variables are defined in the Appendix. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

	Control offices	Treated offices	Difference	T-stat
<i>Ln(Fees from Opportunities)</i>	12.18519	13.20932	-1.024*	(-2.08)
<i># Opportunities</i>	40.14815	85.4	-45.25	(-1.58)
<i># Clients</i>	36.37037	75.525	-39.15	(-1.58)
<i># New Clients</i>	29.62963	33.775	-4.145	(-0.41)
<i># New Employees</i>	1	5.425	-4.425	(-1.50)

Table 4: Effect of the Gamified Training Platform on Performance

Table 4 reports results from tests examining the effect of gamified training on offices' subsequent performance. Panel A reports the estimations based on the sample period *before* offices in the control group started to implement gamified training. Panel B reports the estimations based on the full sample period. *Post* is a dummy variable equal to 1 for all months after the month of implementation of gamified training. *Treated* is a dummy variable equal to 1 if the office implemented gamified training before December 2016. All variables are defined in the Appendix. T-statistics, reported in parentheses, are based on standard errors clustered at the office level. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: Difference-in-differences (sample period *before* the launch of the platform in the control offices)

	(1)	(2)	(3)	(4)
	<i>Ln(Fees from Opportunities)</i>	<i># Opportunities</i>	<i># Clients</i>	<i># New Clients</i>
<i>Post × Treated</i>	0.009 (0.04)	-2.842 (-0.55)	-3.211 (-0.63)	-2.629 (-0.71)
<i># New Employees</i>	0.001 (0.44)	0.166*** (3.97)	0.067 (1.43)	-0.234*** (-3.42)
<i>Constant</i>	12.600*** (36.57)	28.098*** (5.08)	26.589*** (6.21)	-6.178 (-0.87)
<i>N</i>	510	510	510	510
<i>Adjusted R-squared</i>	0.782	0.944	0.944	0.739
<i>Office fixed effects</i>	Yes	Yes	Yes	Yes
<i>Month fixed effects</i>	Yes	Yes	Yes	Yes

Panel B: Staggered treatment (full sample period)

	(1)	(2)	(3)	(4)
	<i>Ln(Fees from Opportunities)</i>	<i># Opportunities</i>	<i># Clients</i>	<i># New Clients</i>
<i>Post</i>	-0.082 (-0.42)	-3.281 (-0.80)	-4.248 (-1.04)	-2.265 (-0.91)
<i># New Employees</i>	0.001 (0.21)	-0.044 (-0.62)	-0.074 (-1.61)	-0.271*** (-10.42)
<i>Constant</i>	12.521*** (29.16)	36.525*** (5.82)	31.618*** (6.47)	-2.025 (-0.32)
<i>N</i>	781	782	782	782
<i>Adjusted R-squared</i>	0.794	0.937	0.940	0.756
<i>Office fixed effects</i>	Yes	Yes	Yes	Yes
<i>Month fixed effects</i>	Yes	Yes	Yes	Yes

Table 5: Moderating Effect of Employee Engagement (Measured as Average Retention Rate in the Pre-intervention Period) on the Performance Effects of Gamified Training

Table 5 reports results from cross-sectional tests on the average retention rate in the pre-intervention period. *Post* is a dummy variable equal to 1 for all months after the month of implementation of gamified training. All other variables are defined in the Appendix. T-statistics, reported in parentheses, are based on standard errors clustered at the office level. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

	(1)	(2)	(3)	(4)
	<i>Ln(Fees from Opportunities)</i>	<i># Opportunities</i>	<i># Clients</i>	<i># New Clients</i>
<i>Post × Pre-period Monthly Retention Rate</i>	89.921** (2.71)	2863.669** (2.66)	2794.249*** (3.59)	1549.666* (2.05)
<i>Post</i>	-89.892** (-2.71)	-2863.370** (-2.67)	-2795.004*** (-3.60)	-1549.994* (-2.06)
<i># New Employees</i>	0.000 (0.16)	-0.048 (-0.72)	-0.079* (-1.88)	-0.274*** (-10.81)
<i>Constant</i>	12.593*** (30.63)	38.820*** (6.01)	33.858*** (6.69)	-0.783 (-0.12)
<i>N</i>	780	781	781	781
<i>Adjusted R-squared</i>	0.796	0.938	0.941	0.758
<i>Office fixed effects</i>	Yes	Yes	Yes	Yes
<i>Month fixed effects</i>	Yes	Yes	Yes	Yes

Table 6: Moderating Effect of Employee Engagement (Measured as Willingness to Log onto the Training Platform) on the Performance Effects of Gamified Training

Table 6 reports results from cross-sectional tests on willingness to log onto the training platform. *Post* is a dummy variable equal to 1 for all months after the month of implementation of gamified training. All other variables are defined in the Appendix. T-statistics, reported in parentheses, are based on standard errors clustered at the office level. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

	(1)	(2)	(3)	(4)
	<i>Ln(Fees from Opportunities)</i>	<i># Opportunities</i>	<i># Clients</i>	<i># New Clients</i>
<i>Post × Willingness to Log On</i>	0.063 (0.21)	19.453* (2.01)	18.855** (2.08)	16.395** (2.15)
<i>Post</i>	-0.099 (-0.52)	-8.463 (-1.55)	-9.271* (-1.72)	-6.632* (-1.80)
<i># New Employees</i>	0.001 (0.21)	-0.037 (-0.54)	-0.068 (-1.50)	-0.266*** (-9.63)
<i>Constant</i>	12.521*** (29.12)	36.462*** (5.85)	31.557*** (6.52)	-2.078 (-0.33)
<i>N</i>	781	782	782	782
<i>Adjusted R-squared</i>	0.794	0.937	0.940	0.758
<i>Office fixed effects</i>	Yes	Yes	Yes	Yes
<i>Month fixed effects</i>	Yes	Yes	Yes	Yes

Table 7: Moderating Effect of Employee Engagement (Aggregated Measure of Retention Rate and Willingness to Log onto the Platform) on the Performance Effects of Gamified Training

Table 7 reports results from cross-sectional tests on an aggregated measure of retention rate and willingness to log onto the training platform. *High Engagement* is a dummy variable equal to 1 if both *Pre-period Monthly Retention Rate* and *Willingness to Log On* are above median. *Post* is a dummy variable equal to 1 for all months after the month of implementation of gamified training. All other variables are defined in the Appendix. T-statistics, reported in parentheses, are based on standard errors clustered at the office level. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

	(1)	(2)	(3)	(4)
	<i>Ln(Fees from Opportunities)</i>	<i># Opportunities</i>	<i># Clients</i>	<i># New Clients</i>
<i>Post × High Engagement</i>	0.517 (1.69)	8.805** (2.08)	9.191** (2.31)	6.451* (1.91)
<i>Post</i>	-0.246 (-1.21)	-6.078 (-1.31)	-7.167 (-1.55)	-4.314 (-1.44)
<i># New Employees</i>	0.001 (0.40)	-0.035 (-0.51)	-0.065 (-1.47)	-0.265*** (-9.34)
<i>Constant</i>	12.578*** (31.44)	37.491*** (5.76)	32.626*** (6.37)	-1.317 (-0.22)
<i>N</i>	781	782	782	782
<i>Adjusted R-squared</i>	0.797	0.937	0.940	0.758
<i>Office fixed effects</i>	Yes	Yes	Yes	Yes
<i>Month fixed effects</i>	Yes	Yes	Yes	Yes

Table 8: Moderating Effect of Platform Engagement on the Performance Effects of the Gamified Training Platform

Table 8 reports results from cross-sectional tests on platform engagement. In Columns 1–4, *Platform Engagement* is measured by *Time Spent on Training*, defined as average amount of active time in training. In Columns 5–8, *Platform Engagement* is measured by *# Questions Answered*, defined as average number of questions answered. *Post* is a dummy variable equal to 1 for all months after the month of implementation of gamified training. All other variables are defined in the Appendix. T-statistics, reported in parentheses, are based on standard errors clustered at the office level. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

	Platform engagement proxy: Average amount of time spent in training				Platform engagement proxy: Average number of questions answered			
	(1) <i>Ln(Fees from Opportunities)</i>	(2) <i># Opportunities</i>	(3) <i># Clients</i>	(4) <i># New Clients</i>	(5) <i>Ln(Fees from Opportunities)</i>	(6) <i># Opportunities</i>	(7) <i># Clients</i>	(8) <i># New Clients</i>
<i>Post × Platform Engagement</i>	-0.016 (-1.49)	-0.203 (-0.46)	-0.142 (-0.35)	0.050 (0.15)	-0.004 (-1.30)	0.002 (0.03)	0.013 (0.16)	0.046 (0.71)
<i>Post</i>	0.029 (0.14)	-1.895 (-0.32)	-3.278 (-0.57)	-2.606 (-0.61)	0.023 (0.11)	-3.342 (-0.61)	-4.600 (-0.85)	-3.529 (-0.90)
<i># New Employees</i>	0.000 (0.11)	-0.047 (-0.68)	-0.076* (-1.74)	-0.270*** (-10.57)	0.000 (0.12)	-0.044 (-0.63)	-0.073 (-1.66)	-0.268*** (-10.19)
<i>Constant</i>	12.506*** (28.82)	36.335*** (5.61)	31.486*** (6.21)	-1.978 (-0.32)	12.512*** (28.92)	36.530*** (5.72)	31.649*** (6.35)	-1.914 (-0.31)
<i>N</i>	781	782	782	782	781	782	782	782
<i>Adjusted R-squared</i>	0.795	0.937	0.940	0.756	0.795	0.937	0.940	0.756
<i>Office fixed effects</i>	Yes	Yes	Yes	Yes	-0.004 (-1.30)	0.002 (0.03)	0.013 (0.16)	0.046 (0.71)
<i>Month fixed effects</i>	Yes	Yes	Yes	Yes				

Table 10: Moderating Effect of the Interaction between Employee Engagement (Measured as Willingness to Log onto the Training Platform) and Platform Engagement on the Performance Effects of Gamified Training

Table 10 reports results from interactions regressions between employee engagement and platform engagement. *High Willingness to Log on* is a dummy variable equal to 1 if the office's percentage of employees who logged onto the training platform is above median. In Columns 1–4, *Platform Engagement* is measured by *Time Spent on Training*, defined as average amount of active time in training. In Columns 5–8, *Platform Engagement* is measured by *# Questions Answered*, defined as average number of questions answered. *Post* is a dummy variable equal to 1 for all months after the month of implementation of gamified training. All other variables are defined in the Appendix. T-statistics, reported in parentheses, are based on standard errors clustered at the office level. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

	Platform engagement proxy: Average amount of time spent in training				Platform engagement proxy: Average number of questions answered			
	(1) <i>Ln(Fees from Opportunities)</i>	(2) # <i>Opportunities</i>	(3) # <i>Clients</i>	(4) # <i>New Clients</i>	(5) <i>Ln(Fees from Opportunities)</i>	(6) # <i>Opportunities</i>	(7) # <i>Clients</i>	(8) # <i>New Clients</i>
<i>Post</i> × <i>Platform Engagement</i> × <i>High Willingness to Log On</i>	-0.003 (-0.11)	1.452*** (5.76)	1.386*** (7.14)	1.050*** (6.23)	0.002 (0.22)	0.549*** (5.93)	0.518*** (6.72)	0.389*** (6.32)
<i>Post</i> × <i>Platform Engagement</i>	-0.026*** (-5.64)	-1.407*** (-10.25)	-1.268*** (-10.39)	-0.822*** (-6.22)	-0.010*** (-5.69)	-0.531*** (-7.35)	-0.482*** (-7.71)	-0.332*** (-6.45)
<i>Post</i> × <i>High Willingness to Log on</i>	0.465 (1.13)	3.144 (0.55)	2.076 (0.44)	2.339 (0.56)	0.515 (1.13)	1.818 (0.31)	0.752 (0.16)	1.339 (0.33)
<i>Post</i>	-0.114 (-0.58)	-2.570 (-0.44)	-3.639 (-0.63)	-3.114 (-0.75)	-0.091 (-0.46)	-1.586 (-0.27)	-2.717 (-0.48)	-2.297 (-0.58)
# <i>New Employees</i>	0.001 (0.34)	-0.035 (-0.53)	-0.066 (-1.62)	-0.261*** (-9.29)	0.001 (0.36)	-0.030 (-0.46)	-0.062 (-1.53)	-0.259*** (-9.20)
Constant	12.421*** (25.91)	35.334*** (5.82)	30.702*** (6.65)	-2.714 (-0.40)	12.415*** (25.86)	35.366*** (5.84)	30.727*** (6.67)	-2.748 (-0.40)
<i>N</i>	781	782	782	782	781	782	782	782
Adjusted <i>R-squared</i>	0.797	0.938	0.941	0.761	0.797	0.938	0.941	0.761
Office fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 11: Moderating Effect of the Interaction between Employee Engagement (Aggregated Measure of Retention Rate and Willingness to Log onto the Platform) and Platform Engagement on the Performance Effects of Gamified Training

Table 11 reports results from interactions regressions between employee engagement and platform engagement. *High Engagement* is a dummy variable equal to 1 if both *Pre-period Monthly Retention Rate* and *Willingness to Log On* are above median. In Columns 1–4, *Platform Engagement* is measured by *Time Spent on Training*, defined as average amount of active time in training. In Columns 5–8, *Platform Engagement* is measured by *# Questions Answered*, defined as average number of questions answered. *Post* is a dummy variable equal to 1 for all months after the month of implementation of gamified training. All other variables are defined in the Appendix. T-statistics, reported in parentheses, are based on standard errors clustered at the office level. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively.

	Platform engagement proxy: Average amount of time spent in training				Platform engagement proxy: Average number of questions answered			
	(1) <i>Ln(Fees from Opportunities)</i>	(2) # <i>Opportunities</i>	(3) # <i>Clients</i>	(4) # <i>New Clients</i>	(5) <i>Ln(Fees from Opportunities)</i>	(6) # <i>Opportunities</i>	(7) # <i>Clients</i>	(8) # <i>New Clients</i>
<i>Post × Platform Engagement × High Engagement</i>	-0.027 (-0.74)	1.401*** (7.34)	1.259*** (7.93)	1.059*** (5.23)	-0.005 (-0.57)	0.465*** (3.40)	0.430*** (3.86)	0.321*** (2.99)
<i>Post × Platform Engagement</i>	-0.028*** (-4.59)	-1.409*** (-7.43)	-1.263*** (-7.96)	-0.780*** (-4.26)	-0.011*** (-4.89)	-0.462*** (-3.41)	-0.426*** (-3.86)	-0.252** (-2.46)
<i>Post × High Engagement</i>	1.105* (1.77)	3.806 (0.98)	4.662 (1.27)	0.119 (0.03)	1.234* (1.83)	2.561 (0.65)	3.372 (0.92)	-0.563 (-0.14)
<i>Post</i>	-0.124 (-0.64)	-0.943 (-0.17)	-2.565 (-0.48)	-1.568 (-0.42)	-0.084 (-0.43)	0.028 (0.00)	-1.538 (-0.27)	-1.077 (-0.26)
<i># New Employees</i>	0.001 (0.32)	-0.043 (-0.64)	-0.072* (-1.75)	-0.268*** (-10.06)	0.001 (0.32)	-0.041 (-0.62)	-0.071* (-1.73)	-0.268*** (-9.97)
<i>Constant</i>	12.584*** (32.62)	37.302*** (5.61)	32.457*** (6.18)	-1.473 (-0.24)	12.604*** (32.99)	38.056*** (5.79)	33.146*** (6.40)	-1.062 (-0.17)
<i>N</i>	781	782	782	782	781	782	782	782
<i>Adjusted R-squared</i>	0.801	0.938	0.941	0.760	0.802	0.938	0.941	0.759
<i>Office fixed effects</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Month fixed effects</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes