How Am I Doing? The Effects of Gamification and Social Sharing on User Engagement[1]

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Abstract

Game mechanics and concepts ("gamification"), as well as virtual "sharing" within social networks, are emerging tools to increase participation in surveys and especially to maintain cooperation in longitudinal studies. As customizable and personalized devices germane to respondents' environment and lifestyle, smartphones have greatly facilitated the development of interactive measurement instruments that are able to challenge and encourage respondents, to evaluate their behavior, and to broadcast it to others in real time.

However, the mechanisms underlying the effects of gamification and social sharing on respondent engagement have not been fully unpacked. These mechanisms may be extrinsic (active interaction or competition with other participants) or intrinsic (reflexive evaluation of one's own performance).

This paper assesses these two mechanisms, relying on data from a 6-week study of an innovative mobile application to measure media consumption behavior. The iPhone application allowed users to record what they watched on TV, to earn badges and "ranks" based on their engagement with the app's various features, and to share their accomplishments with other users.

Mixed-effects panel models show that self-evaluation (checking how one is doing) and positive reinforcement from others increase engagement, whereas extroverted competitive interactions (sharing one's performance with other users) decrease it. These results are significant among the two groups of study participants: one that was gradually exposed to the gamification and social sharing features; and the other exposed to the full-featured app from the beginning. Gamification and social sharing have stronger positive effects for those who were gradually exposed to these features, showing that these effects are independent of other factors, and that they could be explained in part by the novelty of these features. This suggests that gamification and social sharing are effective and self-sustaining (hence, cost-efficient) incentives in panel studies, especially if they promote self-evaluation and keep the study exciting.

Key words: Gamification, Social sharing, Self-evaluation, User engagement, Mobile applications.

I. INTRODUCTION

Longitudinal survey[2]- based research is a fertile ground for developing new strategies to encourage respondents' participation in the study, as well as to maintain their motivation to fulfill the tasks required. Although Internet and mobile surveys effectively reach today's "digitally connected" respondents (who no longer check their mailbox or install a landline), these are not a panacea for panel cooperation and maintenance. Bombarded with various digital stimuli of which survey requests are only one (and often one of the least exciting), potential respondents are less and less likely to engage in longer-term survey research. Since digital surveys are self-administered, no interviewer is present to encourage respondent engagement, leaving respondents to depend on their own motivation to participate in the study. Strategies to decrease respondent burden (such as reducing the length of the questionnaire or the

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[2] For brevity, in this paper we use the term "survey" to refer to any measurement tool aimed at obtaining self-reported data from respondents. This includes questionnaires, logs, diaries, etc.

complexity of the questions) may improve cooperation, but they can also affect the quantity and substance of the data collected (Lai et al. 2012). A new approach is needed to capture and maintain respondents' attention to the data collection process, without compromising the quality of the data provided.

Applying techniques borrowed from games and social networks to survey research has quickly emerged as an effective strategy to increase respondent cooperation. Some researchers even claim that "gamifying" survey participation could be "the single most effective means of engaging with respondents we have discovered" (Puleston 2011). With US smartphone penetration at almost 50% (Pew 2012), leveraging mobile platforms for survey gamification is both methodologically efficient and technically effective, especially for reaching younger respondents (who constitute the largest segment of smartphone users, as well as of gaming and social networking app users[3]). Today's respondents seek entertainment on their smartphones by playing games (60% of mobile app users, according to Pew data reported by Zickuhr and Smith 2012) or by connecting with real (or virtual) friends through social media (47% of mobile app users, ibid.). By catalyzing and rewarding these behaviors (which are not only enjoyable, but also sustainable), including gaming and social sharing features in surveys can reinforce respondent engagement and encourage compliance with the study requirements.

A plethora of tools have been borrowed from gaming and social media environments and applied to survey research. "Game mechanics" (Lai et al. 2012) like points, badges, and levels, and social features like social communities and "likes" have long been used in marketing and are now being experimentally introduced in market research , with generally positive results on respondent engagement (Puleston and Sleep 2011). Using such rewards in market research has been challenging because of the risk of biasing respondents' "natural" behavior and attitudes (this is a smaller risk for marketing, which seeks explicitly to influence consumers' behavior and attitudes). The only behavior that market research studies seek to influence is engagement in, and compliance with, the survey. Indeed, game mechanics that reward experience and mastery of the survey task (e.g., points and levels) are particularly effective for maintaining engagement in longer-term studies, like panel research. But which of these strategies work best, and why? Specifically, to what psychological needs do they respond, and which of these responses are particularly effective at both producing and reinforcing the types of behaviors that boost engagement and compliance? In other words, what is so exciting about receiving a badge, attaining a level, or posting this achievement on a virtual social network, that a respondent would want to keep doing it?

This paper unpacks the mechanisms underlying respondent engagement when game and social mechanics are used in long-term survey research. By assessing which gamification strategies have the greatest positive effect on user engagement, we evaluate the relative salience of the various types of psychological motivation targeted by gamification and social sharing in survey research. First, we give a brief overview of gamification and social sharing as survey research tools. Second, we introduce the present study of a mobile application that tracks media consumption and that includes gamification and social sharing tools. Third, we present the results of a quantitative analysis of the relative effects of these tools on respondent engagement. We conclude by suggesting that gamification and social sharing approaches work best when they appeal to intrinsic motivations, helping respondents track their own progress without pressuring them to compete with one another.

[3] The fact that smartphone users skew young implies that researchers could demographically bias their results by focusing exclusively on game and social networking features to increase survey cooperation. Other strategies to maintain user engagement should be used to ensure wider age coverage (this is outside the scope of this paper).

II. GAMIFICATION AND SOCIAL SHARING

Although gamification and social sharing strategies aim to render the survey-taking experience more enjoyable, they should not shift the respondent's entire focus away from the study and onto the game or the social network. Framing the survey as an experience whose sole purpose is entertainment would not only decrease the quality of the data provided, but also trivialize the topic of the survey and diminish the credibility of the researcher or organization that commissioned it. If not properly designed, game mechanics in particular pose a significant risk to the survey's integrity, because they create a blithe and play-like atmosphere for an endeavor aimed at collecting rigorous and objective data.

With this caution in mind, researchers have developed a definition of gamification that encompasses both its goal (increasing respondent cooperation with a scientific task) and the means by which it is attained (making the experience of thinking through the survey stimulating and enjoyable): "Gamification is the process of game thinking and game mechanics to engage users and solve problems" (Zichermann and Cunningham 2011: xiv). In the context of survey research in particular, "gamification is the process of applying the psychological and sociological factors that drive intense game play to consumer measurement" (Donato and Link 2013: 40). In practice, "gamifying" a survey entails adding elements borrowed from games (i.e., game mechanics) to the survey design: levels of various difficulty, badges, prizes, points, peer recognition, etc.

From the perspective of the survey researcher, gamification strategies should work by motivating respondents to stay engaged in a task that they did not initiate or seek. Cooperation is increased because "respondents who perceive a survey as an enjoyable game-like activity are much more likely to devote effort and thought to its completion, and thus give more valuable answers" (Puleston 2011). By engaging with the game mechanics, respondents engage with the survey (without which they cannot play the game at all). The survey requirements are tasks that respondents must fulfill in their quest for game victory. As Zichermann and Cunningham explain, "games are able to get people to take actions that they don't always know they want to take, without the use of force, in a predictable way" (2011: 15). This predictability is precisely what ensures that the data provided in the gamified study are comparable across respondents, reliable, and (for longitudinal studies) repeatedly provided.

From the perspective of the users (and extending to respondents, though not much data exist on that yet), gamification strategies work because they challenge them to improve themselves through self-evaluation or through competition with others, when social networking / sharing features are also added. The distinction between self-evaluation (i.e., competition with oneself) and competition with others is important, because it points to two different kinds of psychological motivation: intrinsic and extrinsic. The former focuses on the user / player and her own performance, tracked internally and reflexively; the latter focuses on the world outside the user, and her performance tracked externally and actively in comparison to the performance of the user's competitors. Zichermann and Cunningham suggest that the most successfully gamified studies appeal to both types of motivation simultaneously, by reinforcing intrinsic motivation with external rewards (Zichermann and Cunningham 2011: 28). For example, players could be rewarded for their improvement with recognition on a leaderboard or with a material incentive.

However, these authors also warn against alienating respondents who may be driven by one of these motivations more than by the other. Indeed, although the two types of motivation can be connected, they do not have the same strength for everyone. Some respondents may be driven more by the intrinsic desire for self-improvement, regardless of the extrinsic rewards they receive or of how their performance is viewed by others. A gamified survey could help these respondents reflect on their performance, "reach a higher potential and discover things about themselves they didn't already know" (Zichermann and Cunningham 2011: 28). For example, it could help respondents understand that they are good at following complex instructions or at remembering and recording detailed information accurately. The reflexive

desire to improve motivates respondents to engage with the tasks that revealed, tested, and honed these skills. Eventually, the survey becomes practice for developing a skill that respondents are personally and naturally invested in: the survey becomes a reflexive tool for self-improvement. Among reflexive players, the risk to survey engagement is reaching mastery; once they no can no longer improve (because they have reached the top level), they lose motivation. However, this risk could be hedged by ensuring that the levels progress gradually throughout the study, and that the study ends around the time the average player could reach mastery.

Other respondents may be driven more by peer recognition and by the visible status they attain in their social community, especially if this community is built around a game to begin with. Social networking features embedded in the survey instrument seek to create a platform for respondents to "bond" with one another, as well as to attain a reputation that could be motivating to them and inspiring to others (Cooke and Buckley 2008). Extrinsically motivated respondents stay visible in their peer networks by actively promoting their achievements (e.g., by sharing their points or badges), which in turn reinforce their competitive status in the virtual community. Such players regularly post their accomplishments on social networks and check their social feed for likes, endorsements, and other types of recognition from their peers. These players may be driven by the extroverted motivation of being recognized as a leader, with all the extrinsic accolades associated with that (from fame to prizes). The challenge here is diversifying the extrinsic rewards enough to maintain motivation, while keeping cost manageable. "Likes" can get old, as can token financial incentives: "while perhaps still necessary to initially capture the attention of prospective panelists, monetary incentives do little to engage panelists in the longer term" (Donato and Link 2013: 40).

These two types of motivations underline the game dynamics that can be leveraged in surveys to increase respondent cooperation. However, they are "ideal types" rather than clear-cut categories. Most respondents combine introverted with extroverted motivations and intrinsic reflexivity with extrinsic competition, with one stronger than the other depending on the task, level of proficiency, or even mood. Various mechanics within the same game can appeal to different motivations for the same player; this combination of tools and strategies is what researchers call "game dynamics" (Donato and Link 2013). A respondent who is very active in her own social network but less so in the virtual community built around a game may be driven by an extrinsic motivation in the first case and by an intrinsic motivation in the latter. But how can we assess which type of motivation is at work in a specific gamified survey setting? Answering this question is the goal of this paper, which analyzes extroverted / extrinsic and introverted / intrinsic motivation among users of an iPhone application that tracks TV viewing.

III. METHODOLOGY

1. Study design

Nielsen developed a mobile application called *Whatcha Watchin'?*, which allows users to record their viewing of TV programs on their iPhone. The details required from users include TV program title, date, time, location and device viewed on, and whether others were in the audience. A sample of 250 users in New York (NY), Schaumburg (IL), and San Francisco (CA) used this mobile app for 6 weeks from January until February 2012. The 223 users who installed the app and participated in the study received a $50 contingent incentive for their participation. In order to test the effects of gamification and social sharing on user engagement net of other app features, the sample was split into two groups. One group of 100 users (of whom 93 completed the study) was exposed to the full-featured app (including game and social mechanics) from the beginning. A second group of 150 users (of whom 130 completed in the study) was exposed to the app's features gradually, with game mechanics only enabled in week 3 and social mechanics enabled in week 5. While findings from this research are not projectable because this

was a convenience sample, the study does provide many valuable insights into the effectiveness of gamification and social sharing strategies in long-term survey research.

The following game mechanics were included in the app:

- Badges. Respondents could earn five different badges to reinforce compliance with specific tasks (see Table 1). The correspondence between badges and tasks was not made explicit to respondents at the onset in order to avoid biasing their behavior. These badges were meant to provide positive reinforcement for complying with the survey tool's various requirements. For example, respondents earned a badge for their first complete recording of a TV viewing instance (i.e., after they provided the name of the program, date, time and location of viewing, etc.). The badges were meant to create a sense of anticipation and surprise and to inspire users to keep complying with the survey requirements: all badges not yet earned were visible to users, but "grayed-out".

Table 1. *Whatcha Watchin'?* Game mechanics: Badges[4]

Badge	Message	Requirement
Head Start Badge	You received the head start badge for completing your first full TV viewing log-in!	Completion of first full TV viewing login (regardless of types of viewing)
Recall Badge	You received the recall badge for completing your first full past TV viewing log-in!	Completion of first full retrospective TV viewing login
Rebel Badge	You received the rebel badge for completing your first non-traditional (DVR/VCR, On Demand or Online) TV viewing log-in!	Completion of first full DVR/VCR or On Demand or Online TV viewing login
Silver Cornerstone Society	We could not get the data without you! You received the silver cornerstone badge for completion of 5 days of TV viewing.	Completion of at least one viewing event on at least five out of the last seven days
Golden Cornerstone Society	We could not get the data without you! You received the golden cornerstone badge for completion of 10 days of TV viewing.	Completion of at least one viewing event on at least 10 out of the last 14 days

- Points. High-value survey activities were rewarded with points. These activities included accessing the app on a regular basis (regardless of volume of TV viewing data provided), responding to trigger surveys[5], or advancing to a higher level (more on levels below). Similarly to badges, the maximum number of points that could be earned was not shown to users, to maintain an element of surprise each time points were earned and to stimulate the drive for further achievement. Providing unexpected, yet justifiable rewards spread throughout a user's journey in the game has been cited as an effective gamification strategy to maintain players' excitement and motivation (Zichermann and Cunningham 2011: 19).

- Levels. Earning a certain number of points allowed respondents to advance to different levels. Ten progressive levels (modeled after the ranks in a TV production team) could be attained, ranging from "TV viewer" to "Producer" (see Table 2).

[4] From Lai et al. 2012, p. 10.
[5] Short, 5-question trigger surveys were deployed in the mobile app whenever users completed specific activities.

Table 2: *Whatcha Watchin'?* Game Mechanics: Levels[6]

Points	Level	Description
0	TV Viewer	A TV watcher not involved in the TV industry.
1	Grip	The Grip's responsibility is to build and maintain all the equipment that supports cameras.
2	Best Boy	The term Best Boy refers to the best electrician in the team led by the gaffer (chief lighting technician). Best Boys coordinate the team of lighting technicians, and deal with all the logistics and paperwork relating to the role.
3	Gaffer	A Gaffer in the motion picture industry is the head of the electrical department, responsible for the execution (and sometimes the design) of the lighting plan for a production.
4	Fixer	A Fixer provides logistical support, facilitates permits, custom, location, talent, crews, equipment, accommodation and transportation for filmmakers who wish to conduct filming abroad.
5	Story Assistant	The Story Assistant refers to the lead editor on a particular show. They assist in tracking, developing, and conveying the story of a reality show.
6	Editor	Film Editors assemble footage of feature films, television shows, documentaries, and industrials into a seamless end product.
7	Assistant Director (1st)	The First Assistant Director (AD) is the director's right hand person, taking responsibility for a number of important practicalities so that the director is free to concentrate on the creative process.
8	Director	The Director is the driving creative force in a film's production, and acts as the crucial link between the production, technical and creative teams. Directors are responsible for creatively translating the film's written script into actual images and sounds on the screen.
9	Show Runner	A Show Runner is a television industry term referring to the person who is responsible for the day-to-day operation of a television series (although such persons generally are credited as an executive producer).
10	Producer	A Producer sets the situation for the production of a television show or movie. A film Producer initiates, coordinates, supervises and controls all aspects of a production, from fundraising and hiring key personnel, to arranging for distributors. The Producer sees the project through to the end, from development to completion.

The social sharing features embedded in the app were straightforward: users had the option to post their TV viewing activity, as well as their performance in the app (badges or levels earned), on the *Whatcha Watchin'?* social feed for sharing with other participants of the study, or with their own Facebook[7] network. In addition, users could "like" or comment on one another's postings in the app's social feed or on Facebook. Users could choose when and whether to post on either social community.

2. Analysis and results

Although many insights about gamification and social sharing were obtained from this study, this paper focuses on the connection between, on one hand, use of game and social mechanics, and on the other hand, user engagement, measured as compliance with the study's ultimate goal – visiting the app to

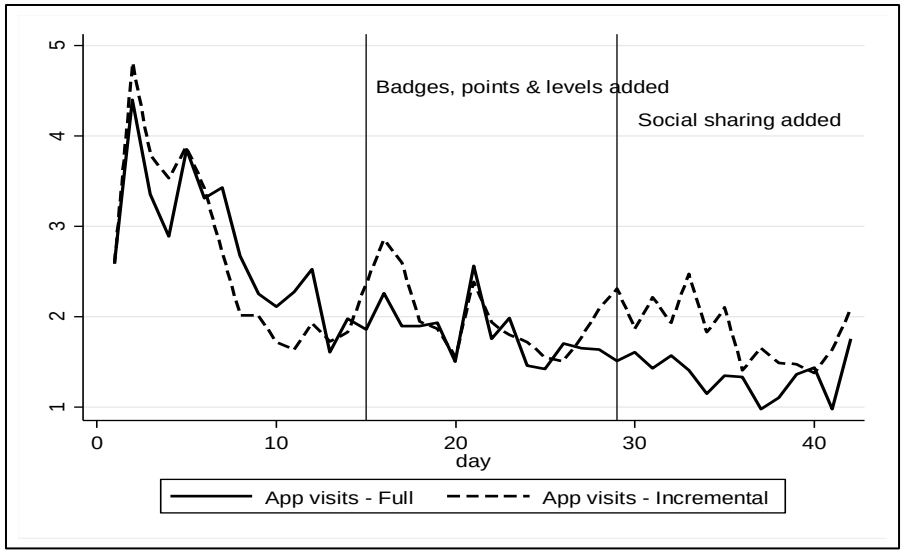
[6] From Lai et al. 2012, p. 11.

[7] In this paper, we focus on sharing in the app's social feed (vs. on Facebook), since our interest is understanding the effects of game and social mechanics *within* our survey research instrument (i.e., within *Whatcha Watchin'?*). Moreover, a very small percentage of users (< 5%) shared their activity on Facebook, possibly because many respondents did not have a Facebook account.

record TV viewing. While enjoying the survey experience is also a component of respondent engagement, data on this topic do not come from within the app directly, but from a follow-up study conducted with a limited number of participants. This paper relies solely on paradata passively collected by the app, which generated enough observations for statistical analysis. Before delving into the statistical models, we first present a few descriptive graphs to illustrate trends in user engagement and use of game and social mechanics throughout the study period.

Figure 1 shows the average number of visits to *Whatcha Watchin'?* across respondents by day, for each of the two groups in the sample – the group exposed to the full app from the beginning (i.e., all game and social features were available throughout the study period), and the group exposed to the incremental app (i.e., the game and social features became available gradually during the study period). The two groups initially follow similar trends: users began by visiting the app between 4 and 5 times a day, then rapidly decreased the number of visits to around 2 in the 2nd week of the study. After that, the quantity of visits decreased slowly (and with few irregularities) for those in the full-app group, while for those in the incremental app the decrease was much more irregular. This is likely due to the introduction of the new game and social mechanics. Indeed, for those in the incremental group, the average number of app visits per user increased in weeks 3 and 5 (when the game and social features were introduced, respectively), but then decreased again. By contrast, the full app group, which was not exposed to any new features, may have lost the initial interest in, and excitement about, using the app.[8] This indicates that game and social mechanics had a positive effect on user engagement. For both groups, the average number of app visits increases toward the end of the study period, but this could be an effect of the incentive expected at the completion of the study (even though this incentive was not dependent on the frequency of app use).

Figure 1. Average number of visits to the app by group

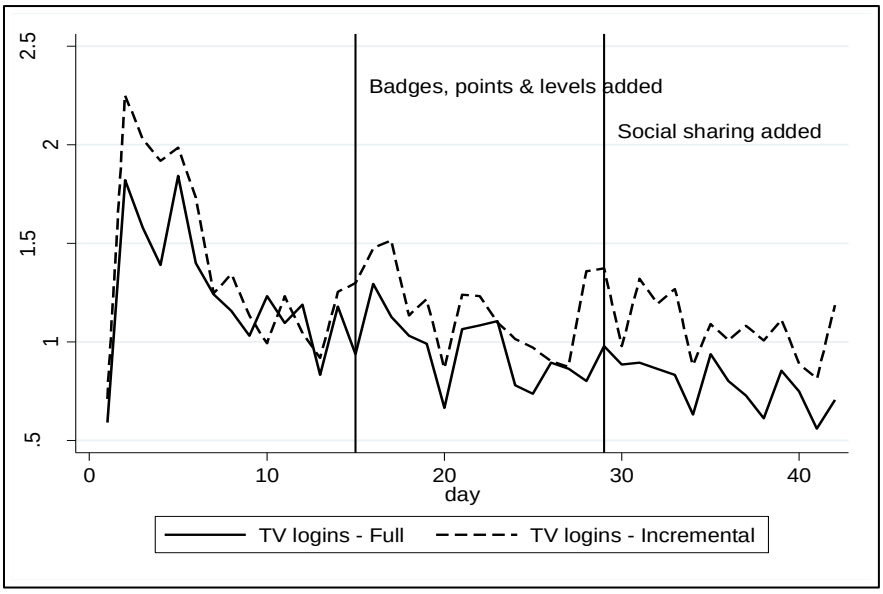


A similar trend is observed when looking at the average number of TV viewing entries logged into the app by users in each group. Initially, respondents logged around 2 viewing entries, but that quantity decreased to about 1 in week 2. Again, we observe sharper increases in number of TV viewing logins among the incremental app group during weeks 3 and 5, when the game and social mechanics were introduced. We note that the graphs in Figures 1 and 2 show the number of TV viewing logins averaged

[8] The initially high, then quickly decreased number of visits to the app could also be a reflection of the learning curve: users visited the app more frequently while they learned their way around it.

across *all* users in a given day, regardless of whether these users visited the app on that day. We chose to calculate the average across the sample (rather than across regular app users) in order to take into account the decreasing number of users who visit the app each day (as shown above). In other words, averaging across all registered users shows overall engagement trends– which is what this paper focuses on.

Figure 2. Average number of TV viewing logins by group



These two graphs suggest a possible connection between gamification and social sharing features in the incremental app group. However, they do not show which specific game and social mechanics most impact user engagement with the app. Below, trends in app visits and TV viewing logins are shown together with trends in use of game and social mechanics for the two groups (i.e., number of status and social feed checks). While sharing one's badge on the social feed and receiving likes from other users are also social mechanics, we do not show graphs of these two variables because the small number of respondents who did not share their badge (8%) or who received likes (1%) does not generate enough variance for a meaningful longitudinal plot. These variables will be included in the more fine-tuned models described below.

Figures 3a and 3b show status checks (recorded each time a user looks at her earned and yet-to-be earned badges), and Figures 4a and 4b show feed checks (recorded each time a user looks at the app's social feed). The graphs are shown for the 2 user groups separately, since the incremental group was exposed to game and social mechanics for less time than the full app group. The averages shown in these graphs are calculated across all users (not just among those who visited the app in a given day) for the same reason explained above – to show an accurate measure of engagement in the entire sample. These figures show that the average number of status and feed checks per day follows the same trend as the average number of app visits and TV viewing logins: it starts high, then decreases sharply, then levels off only to increase again toward the end of the study period. While the relationship between status / feed checks and number of app visits is logical (users must visit the app in order to check their status or feed), the reciprocal is not (checking the status or feed does not explicitly prompt one to come back to the app). Moreover, the relationship between TV viewing logins and status / feed checks is not programmed in the app: users are not prompted to check their status or feed, nor does checking their status or feed prompt them to record more viewings. This suggests that evaluating one's performance (as measured intrinsically by status checks and extrinsically by the social feed) could have a longitudinal effect on user engagement with the app.

Figure 3a. Average number of status checks, app visits and TV viewing logins – Full app

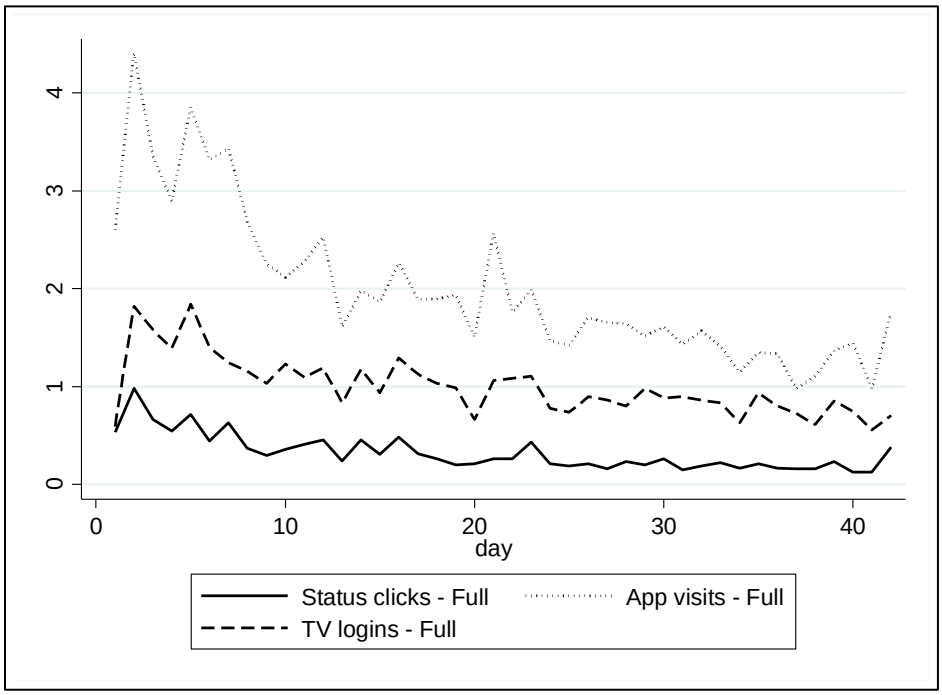


Figure 3b. Average number of status checks, app visits and TV viewing logins – Incremental app

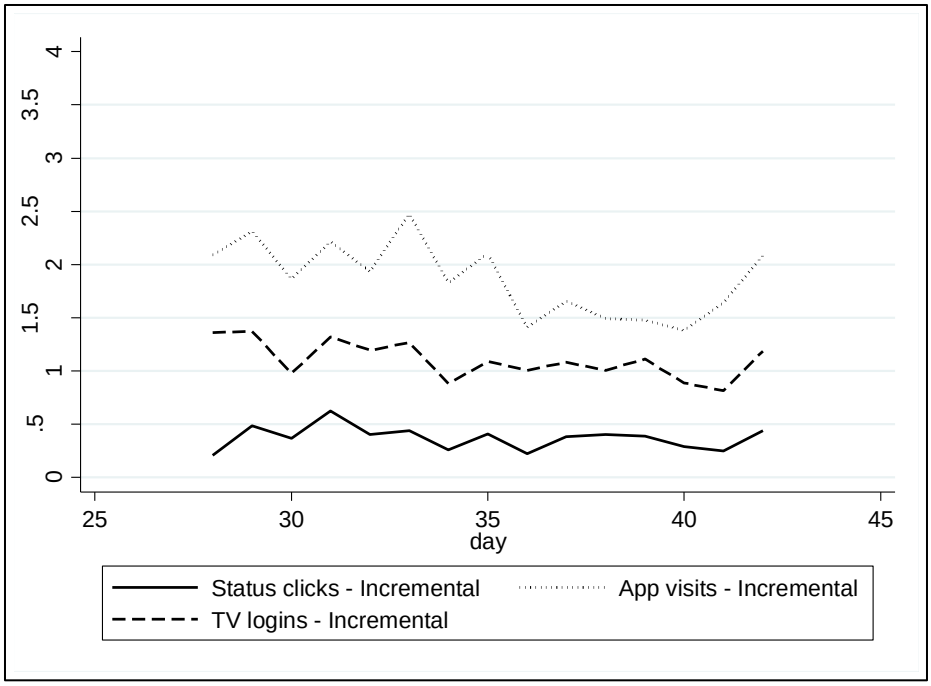


Figure 4a. Average number of social feed checks, app visits and TV viewing logins – Full app

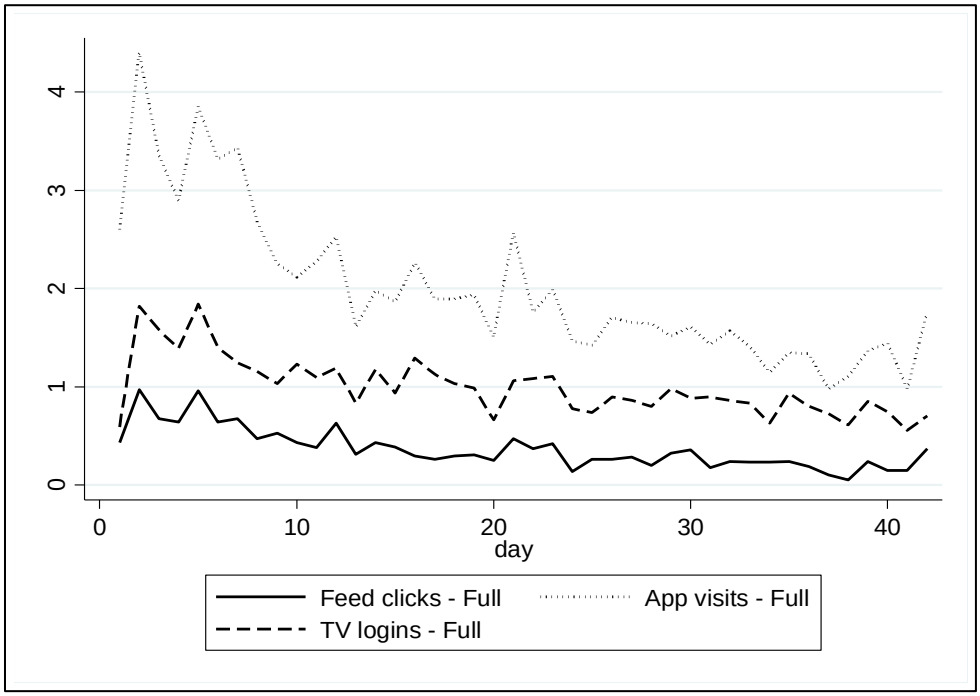
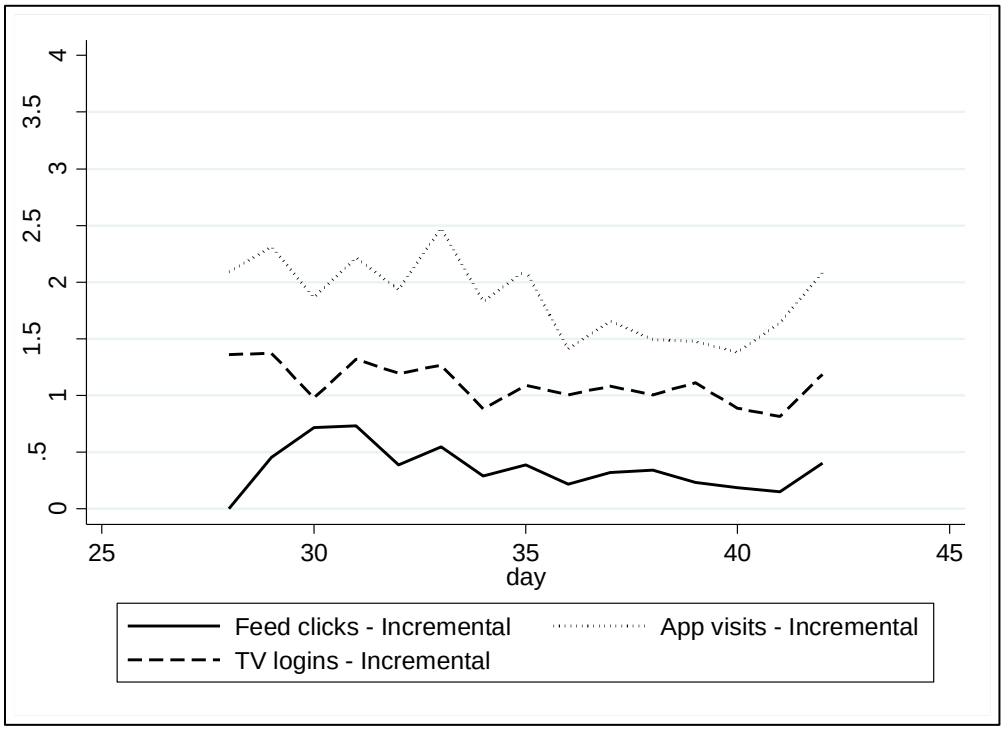


Figure 4b. Average number of social feed checks, app visits and TV viewing logins – Incremental app



To verify whether this longitudinal effect is statistically valid, we include data on use of the app's game and social mechanics in two panel models: one with number of visits to the app as a dependent variable, and one with number of TV viewing entries as dependent variable. The game mechanics we focus on are the level attained (measured from 1 – lowest to 11– highest) and the number of status checks. The social mechanics included are whether the respondents shared their badges (a binary variable), the number of times they checked the app's social feed, and whether they received likes from other members of the app's social community (a binary variable). We control for time, because the trends above indicate that engagement decreases as the study progresses; and for age, because game and social mechanics tend to appeal more to younger respondents.

The model we estimate is represented by the following equation:

$$Y_{it} = \mu + \beta'_{it} + \alpha_i + u_{it}$$

where Y denotes one of the two dependent variables, the i's indicate respondents, the t's indicate days, β' denotes the abovementioned explanatory variables, the intercept $\mu + \alpha_i$ is the sum of a mean value μ and a random error α_i specific to each respondent (constant over time), and u_{it} is specific to each observation (varies for each respondent and each day of the study).

The panel models account for the repeated nature of the observations (i.e., respondents nested within days of the study). In addition, these models account for both respondent-level effects across the period of measurement, and for day-specific effects for each observation. This is due to the inclusion of the random effect (i.e., the error idiosyncratic to each observation). The overall model is a mixed-effects one, because some of the variables included may have fixed effects (e.g., age, which may remain constant throughout the study). Results from these panel models are shown in Table 3. We note again that, while these results are statistically significant among our respondents, they are not projectable beyond our sample, which was convenience-based.

Table 3. Mixed-effects panel regression of user engagement on use of game and social mechanics

	Number of Visits to the App	Number of TV Viewing Logins
Game mechanics		
Level attained	0.059***	0.158***
Number of status checks	0.292***	0.305***
Social mechanics		
Number of feed checks	0.184***	0.065***
Whether others liked	0.026***	0.042***
Whether badge was shared	-0.091***	-0.051*
Controls		
Age	0.101***	0.090***
Day	-0.182***	-0.189***
Observations	9366	
Respondents	223	
Days	42	
R^2	0.309	0.235

* $p < .1$, ** $p < .05$, *** $p < .01$ Standardized coefficients

Indeed, game mechanics have a positive effect on both visits to the app and TV viewing logins entered. The low magnitude of the coefficients is due to their standardization, in order to make them

quantitatively comparable. Status checks have the strongest positive effect on both number of app visits and number of logins: for every standard deviation (s.d.) increase in the number of status checks performed, the number of visits a user makes to the app and the number of TV viewing logins both increase by 0.3 s.d.. Reaching a higher level also increases the number of visits to the app (by 0.1 s.d.) and the number of TV viewing logins (by 0.2 s.d.).

Among social sharing features, feed checks have a positive effect as well, and higher than the effect of having one's posting "liked" by others. Users' age also has a positive effect on engagement, contrary to our expectation that younger viewers would be more engaged with mobile apps. However, this could be an effect of our sample composition, which skewed young (75% of respondents were under 40).

One social feature has a surprising effect. Sharing one's badge on the app's social feed seems to decrease user engagement: users who shared their badge recorded fewer visits to the app and TV viewing logins, than users who did not share their badge. Time had a similarly negative effect, as suggested by the graphs above.

These models were estimated on the entire sample, including those who visited the app and those who did not, and including the full app group and the incremental app group. However, the results shown do not change substantively when including only visitors in a given day (see Table 4) or when including interaction terms for the treatment group (see Table 5). For the interaction models, status checks and badge sharing have stronger effects in the incremental group than in the full-app group. This indicates that the novelty of the game and social features stimulate engagement in the incremental-app group. In fact, the negative effect of badge sharing seems to be due partly to the incremental-app group, which had only 2 weeks available to engage with the social feed. However, one notable finding is that the level attained and the social feed checks had a smaller effect for the incremental app group than for the full app group. This is also likely because users in the incremental group did not have time to attain levels as high as those in the full app group, nor did they have the ability to check their feed for as long as those in the full app group. Indeed, the median level for the incremental group was 4 (vs. 6 in the full-app group), and 36% of respondents did not check their social feed (vs. 23% in the full-app group).

Table 4. Mixed-effects panel regression of user engagement on use of gamification and social features – Among those who visited the app

	Number of Visits to the App	Number of TV Viewing Logins
Game mechanics		
Level attained	0.099***	0.203***
Number of status checks	0.239***	0.230***
Social mechanics		
Number of feed checks	0.218***	0.071***
Whether others liked	0.008	0.026**
Whether badge was shared	-0.075**	-0.014
Controls		
Age	0.132***	0.119***
Day	-0.218***	-0.179***
Observations	4210	
Respondents	219	
Days	42	
R^2	0.2303	0.1166

* $p < .1$, ** $p < .05$, *** $p < .01$ Standardized coefficients

Table 5. Mixed-effects panel regression of user engagement on use of game and social mechanics – Including interaction by treatment group

	Number of Visits to the App	Number of TV Viewing Logins
Game mechanics		
Level attained	0.151***	0.281***
Incremental group *Level	-0.071*	-0.115**
Number of status checks	0.271***	0.269***
Incremental group *Status check	0.032*	0.048**
Social mechanics		
Number of feed checks	0.254***	0.107***
Incremental group *Feed check	-0.076***	-0.037**
Whether others liked	0.026**	0.046***
Incremental group *Other's likes	0.005	-0.002
Whether badge was shared	-0.010	-0.004
Incremental group *Badge shared	-0.389***	-0.266**
Controls		
Age	0.124***	0.147***
Group*Age	-0.168***	-0.183***
Day	-0.106	-0.221**
Group* Day	-0.072**	-0.073**
Incremental group	0.681***	0.767***
Observations	9366	
Respondents	223	
Days	42	
R^2	0.342	0.276

* $p < .1$, ** $p < .05$, *** $p < .01$ Standardized coefficients

As mentioned above, it could be argued that user engagement with the app (measured by visits and TV logins) and the use of game and social mechanics have a reciprocal effect: the more often a user visits the app, the more often she checks her status, the more likely it is for her to get feedback from the app's social network, etc. To address this issue, we also estimated the models above on lagged explanatory variables. That is, the number of app visits and TV viewing logins on day *t* was regressed on status checks, feed checks, likes received, etc. on day *t-1*. The anteriority of the explanatory variables eliminates the possibility that they have an effect on app visits and TV viewing logins. As shown below, the effects of the explanatory variables do not change substantively: number of status checks maintains the strongest effect on both number of app visits and TV viewing logins recorded, while sharing one's badge still has a negative effect.

Table 6. OLS regression of user engagement on lagged use of gamification and social features

	Number of Visits to the App	Number of TV Viewing Logins
Game mechanics		
Level attained	0.431***	0.242***
Number of status checks	0.549***	0.261***
Social mechanics		
Number of feed checks	0.379***	0.049**
Whether others liked	0.760	0.117
Whether badge was shared	-0.994***	-0.295***
Controls		

Age	0.032***	0.016***
Day	-0.093***	-0.045***
Observations	9143	9143
R^2	0.176	0.126

* $p < .1$, ** $p < .05$, *** $p < .01$ Standardized coefficients

IV. DISCUSSION

This paper discussed the relationship between use of game and social mechanics, on one hand, and user engagement with a mobile app to record media consumption, on the other hand. Although evidence from new research on gamification and social sharing suggests that these tools help motivate respondents and make the survey-taking experience more enjoyable, little is known about the differential effect of various game and social mechanics depending on the psychological motivations into which these mechanics tap. In this paper, we focused precisely on assessing which specific gamification and social sharing strategies have the strongest positive effects on user engagement. Using panel models of the respondents' behavior in our sample, we measured and compared the effect of game mechanics (levels attained and checking this achievement) and social mechanics (sharing badges, receiving likes, and checking the social feed) on frequency of app use and on number of TV viewings recorded in the app.

Qualifying the hypothesis that game and social mechanics both have positive effects on user engagement, we found that most game mechanics in our analysis have positive effects, but only some of the social mechanics do so. Although our findings were statistically significant, we remind the reader that these should not be projected to the universe of mobile survey respondents or app users, since our sample was a convenience one. Sharing one's badge on the app's social feed has a negative effect on both app visits and TV entries recorded. Substantively, this finding can be explained by the motivations to which each of these mechanics appeal. The strategies with positive effects all appeal to intrinsic motivations, which allow respondents to reflexively evaluate their own performance without actively engaging in external competition: reaching a level, tracking this progress, and checking other users' reaction to this progress. By contrast, the strategy with negative effects appeals to the extrinsic motivation to actively compete with other users: sharing one's badge on the social feed implies a desire to showcase performance externally, rather than to evaluate it internally. In other words, sharing a badge in itself does not increase engagement if this action does not reinforce a user's positive evaluation of her own performance. The negative effect could be due to several subjective factors (which our paradata do not allow us to verify, but for which we have qualitative evidence from a follow-up study):

- The saturation reached once a user displays a badge. To the extent that respondents were motivated only by the extroverted desire to display their achievement for others, once this display occurs, the motivation to remain engaged in the study decreases. The goal was accomplished, so there is no need to keep playing the game.
- The lack of attachment to the social community represented by the app's social feed. Since the users on the social feed were not necessarily part of each other's personal social networks, there may have been little interest in engaging with this community by displaying in-app achievement. Posting badges could have helped users realize that they do not have many in-app "friends" to bond with, and thus the motivation to continue the activity that earned the badge decreased. Indeed, a follow-up study conducted with 22 respondents revealed that many of them were not interested in participating in a social community composed of strangers with little in common besides the app (Lai et al. 2012).
- The personality of the respondents in our sample. While this is a psychologically plausible explanation, we lack the data to speculate on it.

At the same time, the positive effects of some of the game mechanics could be due not only to their role in self-evaluation, but also to the app's design. Users did not receive a notification when they reached a new level, and were not aware of what exactly they had to do to reach a new level (we purposefully left out this information in order to avoid influencing behavior). Thus, the only way for them to find out how they performed was by checking their own status. That said, users were not prompted to check their status, their social feed, or others' likes; the self-initiated nature of these actions shows engagement. In order to clarify the role of status attainment in compliance, and in order to address the negative impact of badge sharing on the social feed, a subsequent version of the app changed the badge allocation rules in order to connect the badges more to instructional activities (e.g., learning how to use the app) rather than to competitive activities (i.e., actively comparing oneself to others). This version of the app has also eliminated the points and ranks, in order to streamline the extrinsic and intrinsic rewards.

There are several survey-related implications deriving from the fact that game and social features conducive to self-evaluation have more positive and stronger effects than those features aimed at displaying competitive behaviors externally. First, allowing users to track their own progress and observe an improvement in their performance not only maintains engagement, but does so in a self-sustaining manner: as long as there is progress to be made, users will keep checking their performance, which in turn will maintain their engagement. Including a self-evaluation tool in long-term surveys is thus both effective and cost-efficient (since implementing this tool only requires the fixed costs of programming it). Second, forcing respondents to engage in active competition with one another can backfire if they are not extrinsically motivated or if they have no interest in belonging to the particular social community where the competition could develop. In other words, social sharing works if it helps users get better at the task, but not necessarily if it helps them become visibly better than others. Lastly, providing both the tools to measure self-improvement and the opportunity to share it if so desired reaches both intrinsically-motivated / reflexive respondents and extrinsically-motivated / active respondents. The two groups can overlap or merge as the study progresses and as more features are added. Thus, keeping the study surprising, evolving, and challenging not only ensures that users remain engaged, but also that they do so if their motivation for engagement changes. More research is needed to understand when, exactly, changes in motivation occur, and how their triggers could be incorporated in gamified surveys.

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