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Would you like to play? A comparison of a gamified survey with a traditional online survey method

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ABSTRACT

Using the stimulus-organism-response (S-O-R) framework and signaling theory, we evaluated the signaling effect of gamification in online survey systems. Based on the Big Five personality assessment instrument, we developed an experimental study with two surveys – a traditional online survey with Likert scales, and a gamified survey powered by game mechanics. Then we evaluated the effect of both surveys on the users' cognitive and affective reactions, as well as their preference toward the signaler. We also identified game elements that influence the individuals' reactions when interacting with gamified surveys. The results suggest that gamification serves as a positive signal and increases affective reactions. These findings have theoretical and practical implications to improve the design of existing online surveys.

1. Introduction

A recent trend in information systems is to move from utility and usability towards user experience (Hassenzahl, 2010). One of the ways to improve user experience is to add game design elements to otherwise traditional systems. Game elements are now routinely incorporated into technology products and services in an approach called gamification (Deterding, 2014). Online user surveys have been one of the target areas for gamification efforts. Contemporary research in this area has investigated the effect of gamification in market research surveys (Cechanowicz, Gutwin, Brownell, & Goodfellow, 2013), explored the conceptual foundations and design issues associated with gamified surveys (Harms, Wimmer, Kappel, & Grechenig, 2014), and evaluated the effect of gamified surveys on children and adolescents (Mavletova, 2015). This emerging body of research would benefit from additional experimental studies focusing on the influence of survey gamification, and there has been a call for more empirical studies in this domain (Keusch & Zhang, 2017). The study presented herein is different from prior research, as we empirically examine the effect of gamification in online surveys using signaling theory and the Stimulus-Organism-Response (S-O-R) framework, and compare extrinsic and intrinsic game elements as well as their effect on cognitive and affective reactions.

The goal of this paper is to investigate if gamification, defined as the use of gaming mechanics in non-gaming contexts (Deterding, Dixon, Khaled, & Nacke, 2011), may provide the alternative and more effective means to the traditional method of individual data collection. First, we investigate if gamified survey systems increase the respondents' cognitive and affective reactions, as well as their preference toward a signaler. Second, we examine which game elements are impactful in the design of gamified surveys.

To address these research questions, we are bringing together a behavioral framework based on Stimulus-Organism-Response (S-O-R) and signaling theory. The S-O-R framework allows articulating the relation between the stimuli and different types of organismic states, while signaling theory allows us to characterize the nature of the stimulus when it is presented in gamified systems. In this study, we empirically compare the results of a traditional online survey with the results of a gamified survey in the context of personality traits and recruitment. Personality profiling has been typically used in recruitment to determine whether the person fits with the requirements of the job and with the organization (Gardner, Reithel, Cogliser, Walumbwa, & Foley, 2012). User personality data are captured based on the Big Five personality traits: agreeableness, conscientiousness, extraversion, neuroticism and openness to experience (McCrae & John, 1992).

Our study contributes to the gamification literature in several ways. At the theoretical level, we integrate the behavioral S-O-R framework

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with signaling theory to evaluate the effect of gamification in a non-game context such as user personality surveys. At the empirical level, we evaluate the effect of game signals on the users' organismic reactions, such as cognitive and affective reactions, and preference towards a signaler. These issues are novel and important for the IS community. With the increasing interest in gamification and immersive systems, the effects of gamification on users' reactions requires systematic studies to explain current relationships between users and systems, and to inform future research and directions in the design of gamified systems.

The remainder of this paper is structured as follows: first, we introduce the S-O-R framework and our research model. Then, we present related work on gamification and signaling. After this background, we discuss the methodology and results of our analyses, and present implications for theory and practice. Before we conclude, we discuss the limitations of this study and avenues for future research.

2. S-O-R framework

The Stimulus-Organism-Response (S-O-R) framework originates in environmental psychology to describe interactions between the environment and behavioral responses to the environment. The framework has been influenced by the S-R (stimulus – response) model, which posits that individuals make rational behavioral decisions, in the presence of a stimulus (Jacoby, 2002). Stimulus is the influence that arouses an individual and leads to approach or avoidance behavioral responses. Since individual differences play an important role in human decision-making, S-O-R extends the original S-R framework by adding different types of organismic reactions such as cognitive and affective processes of individuals (Mehrabian & Russell, 1974).

Mehrabian and Russell's (1974) conceptualization of the S-O-R is the basis of most research on the impact of environmental factors on consumer behavior (Kaltcheva & Weitz, 2006). The framework has also been widely used in the information systems research, such as impulse buying in mobile commerce (Zheng, Men, Yang, & Gong, 2019), branding co-creation on social media (Kamboj, Sarmah, Gupta, & Dwivedi, 2018), online auctions (Cui, Lai, & Lowry, 2016), social shopping websites (Hu, Huang, Zhong, Davison, & Zhao, 2016), online information product design (Song, Zhang, & Zhang, 2013), virtual worlds (Animesh, Pinsonneault, Yang, & Oh, 2001), interactivity of websites (Jiang, Chan, Tan, & Chua, 2010), atmospherics and perceptual curiosity in online shopping (Koo & Ju, 2010), and website and product presentation (Parboteeah, Valacich, & Wells, 2009). The S-O-R framework posits that various elements of the environment, such as architecture, symbols, artifacts or spatial arrangements, can act as stimuli that affect people's organismic or internal experiences (Animesh et al., 2001). These experiences form the behavioral responses to the stimuli. In an online environment, the stimuli often refer to the elements of product design, such as product presentation, content and format (Parboteeah et al., 2009), or technological and spatial features of information systems (Animesh et al., 2001).

Research in gamification provides a unique opportunity to extend the S-O-R framework to new areas. When interacting with an online survey, respondents have various ways to respond to web-based stimuli. When an online survey is gamified, the organismic reaction may differ from a reaction to a traditional online survey. The gamification may serve as a signal drawn from the environment that influences the users' affective and cognitive states such as enjoyment and attention, and ultimately their attitudes towards the stimuli and a signaler (i.e. the person or organization that provides the signal).

Fig. 1 depicts our research model. In the context of the S-O-R framework, stimulus is conceptualized as an environmental influence that arouses an individual and affects their internal organismic states. For online surveys, the environment is confined to a computer screen, and the stimulus consists of the visual cues available to individuals as they progress from the beginning of a survey to the end. When a survey is gamified, an individual is exposed to different cues consisting of game elements. These game elements may affect the organismic reactions differently and may provide a differentiating signal in the evaluation of a signaler.

3. Gamification and affective and cognitive reactions

Games seek to entertain and provide enjoyable experiences while developing the players' skills, such as problem solving, improvement of physical abilities or acquiring new skills. Successful games are usually easy to learn, have a defined set of goals, add complexity at each level, and offer rewards when goals are complete. Gamification is the adoption of games beyond entertainment to make certain tasks more motivating and engaging. The term gamification gained recognition in the last decade when it started being widely used both by academics and practitioners (Werbach & Hunter, 2012). Some of the common definitions of gamification are the use of game design principles in non-gaming activities to improve user experience and engagement (Deterding et al., 2011), a process of enhancing services by motivational affordances to influence gameful experience and further behavioral outcomes (Hamari, Koivisto, & Sarsa, 2014), and the creation of games for non-entertainment purposes and the transformation of existing systems into games (Seaborn & Fels, 2015). The first wave of gamification research attempted to answer the question if gamification worked (Nacke & Deterding, 2017). Since then, the gamification research has matured and become more theory-driven and applicable to various areas of research (Nacke & Deterding, 2017), such as gamification in education (Toda, do Carmo, da Silva, Bittencourt, & Isotani, 2019), travel and hospitality (Moro, Ramos, Esmerado, & Jalali, 2019), health and fitness apps (Lister, West, Cannon, Sax, & Brodegard, 2014), and the workplace (Dale, 2014). However, as some authors point out, there are not enough research and design guidelines regarding gamified information systems (Liu, Santhnam, & Webster, 2017).

Gamified systems are not always game-like but employ the same system of motivation as games do (Werbach & Hunter, 2012). Unlike games, gamification is the use of a combination of game elements instead of developing a full-blown computer game (Schöbel, Söllner, & Leimeister, 2016). Common game elements used in gamification are badges, scores, trophies, rankings, reputation points, group tasks, goals and avatars (Blohm & Leimeister, 2013).

Based on the definitions described above and for the purpose of this research, we define gamification as using a combination of game elements in a non-game context for designing a gamified survey system. This gamified survey is capable of motivating users to provide self-reported data while improving the users' enjoyment and increasing attention.

According to the S-O-R framework, when individuals encounter a particular stimulus, they form affective and cognitive reactions along with their responses toward the stimulus. We theorize that an online survey is a stimulus that typically elicits specific responses. This stimulus, when enhanced with game elements, modifies the environment and affects the cognitive and affective states of individuals. The cognitive state refers to acquisition, processing, retention and retrieval of information that goes through the individuals' minds (Eroglu, Machleit, & Davis, 2001). Cognition refers to internal processes of the mind and includes attention, beliefs, comprehension, knowledge and memory (Eroglu et al., 2001). While each of these processes can be relevant for online surveys, our research focuses on attention of the individuals during the survey. Traditional online surveys often provide a monotonous environment that results in response set bias, acquiescence bias, or extreme responding as the respondents' attention decays (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Since gamified surveys have a different design, they are likely to influence individuals differently by keeping their interest for longer time. Thus, we propose that gamified surveys will affect the individuals' cognitive reactions by increasing their attention.

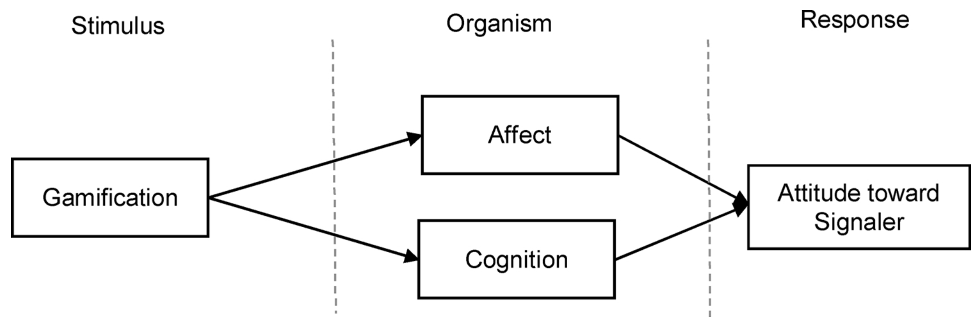

Fig. 1. The Research Model.

H1. Online gamified survey systems will influence cognitive reactions of respondents by increasing their attention.

The affective states in the S-O-R framework are often characterized in terms of pleasure, arousal, and dominance (Mehrabian & Russell, 1974). Russell (1979) suggested that pleasure and arousal are generally sufficient to measure emotions that arise in response to environmental stimuli. Research suggests that affect can have more explanatory power than cognition under certain circumstances, and individuals often exhibit greater similarity in affective reactions than in reason-based or cognitive assessments (Zhang, 2013). Gamified systems are known to provide hedonic benefits such as enjoyment (Hamari & Koivisto, 2015), and gamification has been increasingly used to enhance user experience by adding fun to existing information systems (Suh, Cheung, Ahuja, & Wagner, 2017). Applied to online surveys, we propose that gamification modifies the environment by presenting a stimulus that influences the affective state of the individuals and increases their enjoyment. Thus, we propose:

H2. Online gamified survey systems will influence affective reactions of respondents by increasing their enjoyment.

4. Signaling theory

We turn to signaling theory to articulate how a stimulus, such as an online survey, can be enhanced with gamification, and articulate the effects of such enhancement. Signaling theory offers a framework that explains how signals, or visible features of an object, are used by one party to convey hidden or limited information to another party (Wells, Valacich, & Hess, 2011). This theory explains the behavior of two parties – a signaler and a signalee, when they have access to different information (Connelly, Certo, Ireland, & Reutzel, 2011). A signaler selects signals to convey certain information, while a signalee interprets these signals to infer more information about a signaler. Signals are visible features of an object that can be changed according to a signaler's preference (Spence, 1973). We integrate signaling theory with the S-O-R framework by associating the notion of object with the concept of stimulus. In this context, the signals are game elements added to a survey.

Signaling theory explains how signals can be used to influence the signalees' attitude towards a signaler. Signaling can increase symbolic value of a signaling party. The symbolic value relates to the image and reputation of a signaler and is considered a fit between technology and organizational environment (Grover, Chiang, Liang, & Zhang, 2018). The symbolic value can be observed from sensing technology innovation (Grover et al., 2018; Roberts, Campbell, & Vijayasarathy, 2016). The benefits for the signaler can be twofold: first, in the context of the S-O-R framework, the signaler may send a positive differentiating signal by changing the stimulus (i.e. enhancing it with game elements) and gain reputational effects by introducing these enhancements in a context that typically does not employ these enhancements. Second, by observing the signalee's interaction with a gamified system, signalers may draw different conclusions about signalees than when observed via traditional survey systems. As discussed in the previous section, the benefits for the signalee may include increased enjoyment and more interest in performing the task. Enhancing the stimulus by game elements is thus beneficial for both parties.

Game elements may potentially influence user behavior and attitudes (Feng, Ye, Yu, Yang, & Cui, 2018; Mekler, Brühlmann, Tuch, & Opwis, 2017; Sailer, Hense, Mayr, & Mandl, 2017; Schöbel et al., 2016). Thus, signalers can experiment with gamification elements to invoke desired behaviors. Gamification elements can be grouped into *rewards* or collection systems that include points, badges or virtual goods (Schöbel & Janson, 2018), *constraints* such as time pressure (Deterding et al., 2011), and *self-representation mechanisms* such as avatars (Harms, Biegler, Wimmer, Kappel, & Grechenig, 2018).

Rewards are used to provide user feedback and are employed in gamified systems that require quantifiable performance measures (Liu et al., 2017). Gamified rewards are extrinsically motivating (Schöbel et al., 2016), and can induce initial actions and influence the behavior, such as the development of new habits (Liu et al., 2017). When the stimulus is enriched with extrinsic game design elements, individuals may become more focused on the system and may exhibit more attention towards the system. Thus, we propose:

H3a. The extrinsic design mechanism, such as rewards, will influence cognitive reactions of respondents by increasing their attention.

Rewards in games are given for the successful accomplishment of activities within a gamified environment, and may serve to depict a player's progress, provide feedback or to confirm achievements (Sailer et al., 2017). Emotional responses in gamified experience are generally fun-oriented and engaging (Robson, Plangger, Kietzmann, McCarthy, & Pitt, 2015). In addition, point-rewarding mechanisms have been found to influence playfulness and enjoyment (Feng et al., 2018; Von Ahn & Dabbish, 2008). We propose that when the stimulus is enhanced with extrinsic game design elements, individuals will experience more enjoyment.

H3b. The extrinsic design mechanism, such as rewards, will influence affective reactions of respondents by increasing their enjoyment.

Constraints belong to one of the most important parts of game design (Fullerton, 2014). A number of games contain constraints such as time pressure, a limited number of lives or attempts, or limited resources. Unlike rewards, that are extrinsic components of the game with possible cooperation with others, constraints are intrinsic and are experienced at the individual level (Schöbel & Janson, 2018). Constraints offer uncertain outcomes and make the experience more challenging. Research supports the idea that intrinsic motivation increases engagement and attention (Liu et al., 2017). Thus, individuals when encounter intrinsic game design elements may exhibit more attention towards the system.

H4a. The intrinsic design mechanism, such as constraint, will influence cognitive reactions of respondents by increasing their attention.

Constraints make the experience not only more challenging, but also more gameful (Fullerton, 2014). Overcoming constraints in a gamified environment may lead to feelings of efficiency and success (Sailer et al., 2017) and potentially make individuals feel more competent and accomplished. Constraints in games promote enjoyment (Fullerton, 2014), thus we believe that individuals will exhibit increased enjoyment when constraints are introduced in a gamified environment.

H4b. The intrinsic design mechanism, such as constraint, will influence affective reactions of respondents by increasing their enjoyment.

Self-presentation via avatars are common in action and roleplaying games (Deterding et al., 2011). They are considered to be among the most elaborate examples of self-presentation and impression management (Jenkins, 2010), and have been shown to present stable aspects of their owners (Axelsson, 2002). Avatars provide players with a sense of control and encourage user personalization (McNamara, Jackson, & Graesser, 2009). Avatars have a significant impact on user performance and engagement (Kao & Harrell, 2015). Allowing users to control some aspects of the game create opportunities for players to become invested in game environment (Richter, Raban, & Rafaeli, 2015) thus increasing their attention. Consequently, we posit that:

H5a. The self-presentation mechanism, such as avatar, will influence cognitive reactions of respondents by increasing their attention.

Trepte and Reinecke (2010) demonstrated that when a player identifies with an avatar, the perceived enjoyment of playing the game is increased. Avatar customization stimulates the identification with avatar and increases enjoyment and positive affect of a player (Birk, Atkins, Bowey, & Mandryk, 2016). Thus, the availability of self-presentation via an avatar in an online survey is likely to increase respondent's enjoyment.

H5b. The self-presentation mechanism, such as avatar, will influence affective reactions of respondents by increasing their enjoyment.

Finally, aligned with the S-O-R framework, the response to a stimulus is influenced by the respondents' cognitive and affective reactions. The role of a signaler is to select signals that may inform signalees about the quality of a signaling party (Connelly et al., 2011). If gamification is chosen as a signal to convey information to signalees, the respondents may express a behavioral response of approach rather than avoidance towards the signaling party. The value of signaling can be observed from sensing technology innovation (Grover et al., 2018; Roberts et al., 2016). If a signaling party offers a gamified survey as opposed to a traditional survey, a respondent may perceive a signal as more innovative and evaluate a signaler more positively. We expect that individuals will experience stronger positive cognitive reactions when interacting with a gamified survey as opposed to a traditional survey.

H6a. Cognitive reactions caused by gamification will have a stronger effect on the preference toward a signaler than cognitive reactions caused by a traditional survey.

The S-O-R framework posits that pleasure and arousal are generally sufficient to measure emotions that arise in response to environmental stimuli (Russell, 1979). Affective reactions as a response to enjoyment and fun have strong explanatory power (Zhang, 2013). Applied to online surveys, we propose that gamified environment may provide a stronger stimulus that influences the affective state of the individuals. As a result, respondents may experience more affection toward a signaler that uses a gamified approach as opposed to a signaler who uses a traditional approach.

H6b. Affective reactions caused by gamification will have a stronger effect on the preference toward a signaler than affective reactions caused by a traditional survey.

Signal preparation requires a certain level of effort from the entity producing the signal. A larger perceived investment in preparing the signal has a stronger positive effect for online signalers (Mavlanova, Benbunan-Fich, & Lang, 2016). Considering that gamified surveys require more effort to be created, gamification may serve as a positive differentiating factor. In addition, online environmental signals impact the consumers' emotions and intentions (Koo & Ju, 2010). If gamification is perceived as more enjoyable and fun, it may serve as a strong differentiating signal for the signaling party. Thus, we propose:

H7. Organizations employing gamified surveys will be preferred over those employing traditional surveys.

5. Methodology

For the purpose of this study, two surveys were created. Both surveys evaluated the personality of an individual and were based on the Big Five taxonomy. The Big Five is considered the most widely accepted taxonomy of personality traits in psychology research (Almlund, Duckworth, Heckman, & Kautz, 2001), and has received theoretical and empirical support in the literature related to job performance and occupations (Fang et al., 2015; Judge & Zapata, 2015; Ones, Dilchert, Viswesvaran, & Judge, 2007), online shopping behavior (Bosnjak, Galesic, & Tuten, 2007), social networks (Fang et al., 2015), career mobility and career success (Gattiker & Larwood, 1988; Seibert & Kraimer, 2001), leadership (Judge, Bono, Illies, & Gerhardt, 2002), job satisfaction (Judge, Heller, & Mount, 2002), job instability (Wille, De Fruyt, & Feys, 2010), and upward job changes (Nieß & Zacher, 2015). The Big Five is a five factor structure that is typically labeled as Agreeableness, Conscientiousness, Extraversion, Neuroticism and Openness to Experience (John & Srivastava, 1999).

The first survey was created in Qualtrics and included 44 Big Five assessment questions (John & Srivastava, 1999) measured on a scale from 1 to 5. A gamified solution was created in HTML and included 15 assessment questions embedded in a story that required a respondent to walk through a series of screens to complete the task. The 15 gamified personality questions for the gamified solution were selected based on the results of a pilot study conducted earlier. In the pilot study, 225 participants completed the Big Five questionnaire in Qualtrics. Three questions per construct were selected based on their loadings and relatedness to the game storyline.

The gameplay in the gamified system was based on the recruitment and teamwork scenario. It required a player to take a role of a new hire and progress through several steps in order to contribute to the team score. First, players created an avatar. Then they were offered a choice of working with a hypothetical team or alone and completed the task. The task consisted of several aptitude questions and contributed points to the overall team score. The task was accompanied by a timer. The structure of the game was based on solution games (Fullerton, 2014) in which a player should solve a puzzle faster or more accurately then competitors.

The design and overall look of the gamified system were informed by the analysis of existing text-based games and solution-based games. Examples of solution games are graphic adventures, textual adventures and games that have puzzle qualities. Gameful experience in the gamified solution included personalization, time constraint, and scoring mechanism and was operationalized using these game elements: avatar, timer and points. The avatar offered choices of gender (F/M) and a choice of hairstyle, face features and complexion. The timer appeared when participants were answering a set of aptitude questions. The points were assigned based on the number of correctly answered questions.

Both surveys measured user personality. In the gamified system, Agreeableness was tested by the willingness of participants to assist and cooperate with others in the game. Openness was evaluated by testing the participants' curiosity and desire to get involved in more interesting challenges. Extraversion was assessed by the willingness of participants

Table 1
The Big Five Constructs in the Game.

Construct	Examples in the Game
Agreeableness	Cooperating with others Showing sympathy to others
Conscientiousness	Performing a thorough job Determined to complete the task
Extraversion	Participating in team activities Active communicating with others
Neuroticism	Nervousness during the game Signs of irritation during the game
Openness to Experience	Seeking more exciting tasks Showing curiosity

to communicate with others. Conscientiousness was evaluated by the readiness of participants to do a thorough job on the tasks in the game, and neuroticism was evaluated by the level of irritation or unhappiness during the game. Each construct was measured with three questions. The questions corresponded to the Big Five personality constructs (see Table 1). At the end of the game, participants were redirected to an online questionnaire developed in Qualtrics, which contained demographic questions, a Big Five survey (John & Srivastava, 1999) The cognitive reactions were measured via the focused attention scale (O'Brien & Toms, 2010) and included three items: (1) I was so involved filling out the survey that I ignored everything around me, (2) When I filled out the survey I lost the track of time, (3) When I filled out the survey I was absorbed with the task. The affective reactions were measured via the enjoyment scale adapted from (Koufaris, 2002) and included three items: (1) I really liked answering the survey, (2) I enjoyed filling out the survey, (3) The survey was fun. To reduce the concern for common method variance (Podsakoff, Whiting, Welsh, & Mai, 2013) several items were measured with reverse scales.

The game and instructions were pilot tested and refined prior to their administration for this study. Fig. 2 shows the example of a gamified question, while Fig. 3 shows an example of a traditional online survey to measure Openness to Experience.

Two experimental conditions were implemented in the study. In the first condition, participants completed the game, then answered the Big Five survey (John & Srivastava, 1999) and reported their demographic data. In the second condition, the participants first answered the Big Five survey, played the game, and then reported their demographic data. By counterbalancing the order of the data collection artifacts (survey and gamified system), we ensured that the preferences were not affected by the order in which a participant interacted with each one. From each respondent, we collected comparable personality data from the game and the survey. Attention and enjoyment were measured with three five-item Likert scale questions per construct (Koufaris, 2002; O'Brien & Toms, 2010).

6. Results

Participants were recruited from a subject pool at a large urban college in the Northeast of the U.S. and were randomly assigned to one of the two established conditions. The experimental treatment was administered online, including the instructions on how to proceed, to avoid experimenter effects and to ensure that all participants received the same information. The study sample consisted of 694 participants with 392 and 302 participants in conditions 1 and 2 respectively. Fifty-one percent (354) of respondents were female and 49 percent (340) were male. Most of the respondents were between 18–24 years old (83%), and 14% of respondents were 25–34 years old. To evaluate the effectiveness of the random assignment, we fit a logistic regression model with all variables predicting an experimental group dummy variable. The McFadden R^2 index of 0.099 suggests a poorly fitting model. Thus, we conclude that there are no significant differences in the dependent variables between the two experimental conditions. In other words, the order of presentation did not significantly affect the outcome variables in this study.

The data were analyzed using partial least squares path modeling in R (plspm package version 0.4.9). A two-step approach based on the recommendations by Henseler, Hubona, and Ray (2016) was used. First, the reliability and validity of the measurement model was established. Second, the path coefficients of the model were evaluated using a bootstrapping method with 100 samples. To assess whether gamified surveys can collect comparable user data, we created a path model in which each of the Big Five personality factors (i.e. agreeableness, conscientiousness, extraversion, neuroticism, openness to experience) from the survey was regressed onto the corresponding Big Five personality factors from the gamified system. After removing low loading items, the resulting model exhibits favorable construct reliability measures (i.e. Dillon-Goldstein's $\rho > 0.7$, 1^{st} eigenvalue > 1, 2^{nd} eigenvalue < 1, see Table 2) and inter-construct correlations (see Table 3).

The positive and significant path coefficients associated with the

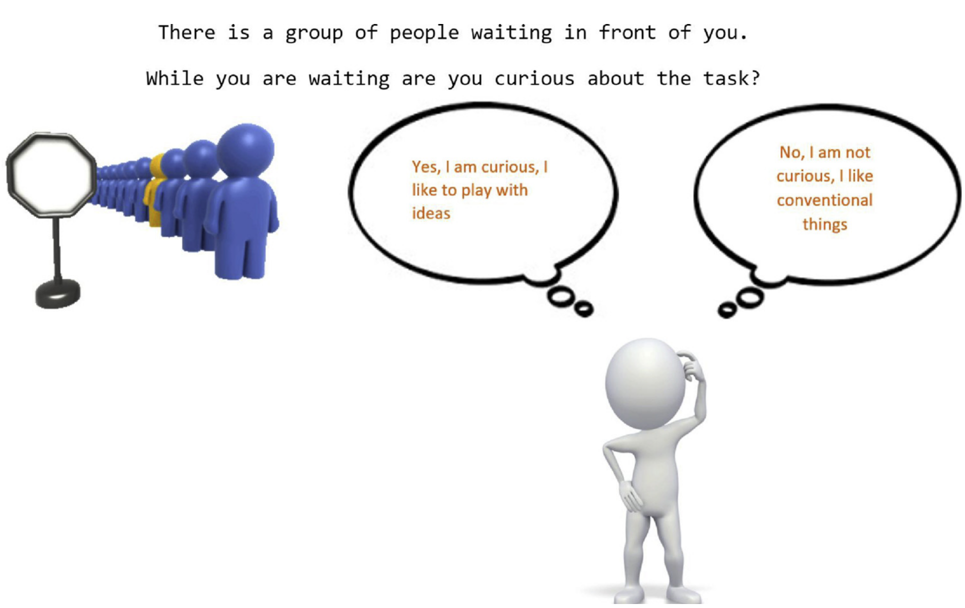

Fig. 2. Example of a Big Five question in the gamified solution.

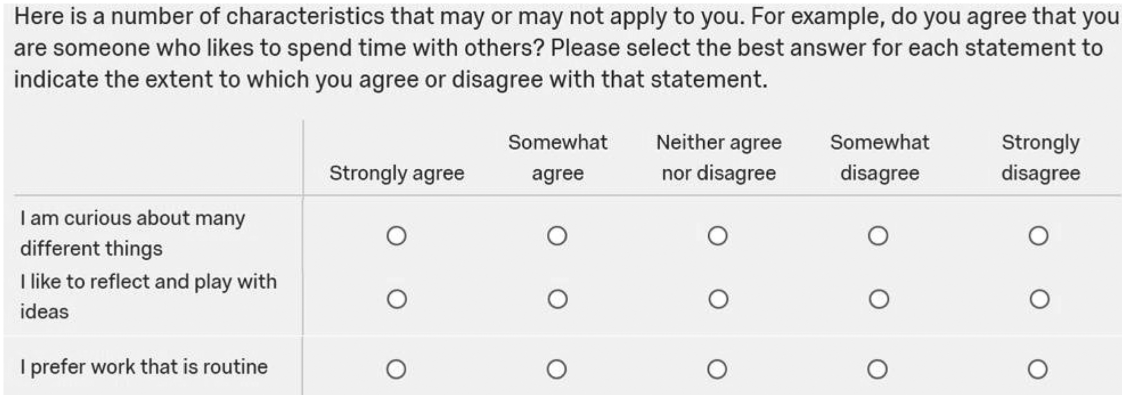

Fig. 3. Example of a Big Five question in the Qualtrics survey.

corresponding Big Five factors between the survey and the gamified system strongly suggest that the survey and the gamified system indeed collect comparable user data. A summary of the results of the path analysis is shown in Fig. 4.

To test hypotheses 1 through 7, we created a new path model in which attitude towards extrinsic mechanism, attitude towards intrinsic mechanism, and attitude towards self-presentation mechanism were regressed onto both cognitive reactions and affective reactions in the gamified system, which in turn were regressed onto preference towards a signaler. After removing low loading items, the resulting model exhibits favorable construct reliability measures (i.e. Dillon-Goldstein's $\rho > 0.7$, 1st eigenvalue > 1, 2nd eigenvalue < 1, see Table 4) and inter-construct correlations (see Table 5).

To test the effect of gamification on cognitive reactions (H1), we performed a paired samples *t*-test on the rescaled factor scores of cognitive reactions towards the game ($M = 3.349$, $SD = 0.954$) and cognitive reactions towards the survey ($M = 3.291$, $SD = 0.969$). The mean difference is not significant ($M_{diff} = 0.058$, $p > 0.05$), leading us to reject H1. Thus, gamification seems not to affect cognitive reactions. To test the effect of gamification on affective reactions (H2), we performed a paired samples *t*-test on the rescaled factor scores of affective reactions towards the game ($M = 3.409$, $SD = 0.974$) and affective reactions towards the survey ($M = 3.251$, $SD = 0.938$). The mean difference is significant ($M_{diff} = 0.159$, $p < 0.001$), providing support for H2. In other words, gamification appears to increase affective reactions. To test hypotheses H3a/b through H6a/b, we evaluated the corresponding path coefficients in the path model as shown in Fig. 5.

As can be seen in Fig. 5, the path from attitude towards the extrinsic mechanism to cognitive reactions towards the game is not significant ($\beta = 0.055$, $SE = 0.057$, $p > 0.05$). Contrary to expectations, it appears that attitude towards the extrinsic mechanism does not impact cognitive reactions towards the game. Hence, H3a is not supported. On the other hand, the path from attitude towards the extrinsic mechanism to affective reactions towards the game is positive and significant ($\beta = 0.118$, $SE = 0.056$, $p < 0.05$), which suggests that attitude towards the extrinsic mechanism increases affective reactions. Thus, H3b is supported. In contrast, the paths from attitude towards the intrinsic mechanism to cognitive reactions ($\beta = 0.214$, $SE = 0.055$, $p < 0.001$), and affective reactions ($\beta = 0.258$, $SE = 0.054$, $p < 0.001$), towards the game are both positive and significant. Thus, attitude towards the intrinsic mechanism increases cognitive and affective reactions towards the game. Hence, H4a and H4b are both supported. Likewise, the paths from attitude towards the self-presentation mechanism to cognitive reactions ($\beta = 0.134$, $SE = 0.045$, $p < 0.01$) and affective reactions ($\beta = 0.116$, $SE = 0.044$, $p < 0.01$) are both positive and significant. This suggest that attitude towards the self-presentation mechanism increases both cognitive and affective reactions towards the game. Hence, H5a and H5b are both supported. The paths from cognitive reactions towards the game ($\beta = -0.075$, $SE = 0.064$, $p > 0.05$) and cognitive reactions towards the survey ($\beta = -0.010$, $SE = 0.059$, $p > 0.05$) to preference towards signaler are both not significant. Thus, it appears that cognitive reactions do not impact preference towards the signaler. Moreover, the difference between the two path coefficients is also not significant ($\Delta = -0.065$, $p > 0.05$). Thus, we can conclude that cognitive reactions do not have a different impact on preference towards the signaler whether they were caused by gamification or by a traditional survey. Hence, H6a is not supported. On the other hand, the paths from affective reactions towards the game ($\beta = -0.361$, $SE = 0.063$, $p < 0.001$) and affective reactions towards the survey ($\beta = 0.145$, $SE = 0.058$, $p < 0.05$) to preference towards signaler are both positive and significant. Thus, the data suggest that affective reactions increase preference towards the signaler. More importantly, the difference between the two path coefficients is also significant ($\Delta = -0.506$, $p < 0.001$). This suggests that affective reactions caused by gamification have a stronger impact on preference towards the signaler than affective reactions caused by a traditional survey. Thus, H6b is supported.

Lastly, to test if organizations employing gamified surveys are preferred over those employing traditional surveys (H7), we performed a one sample *t*-test between proportions on the rescaled factor score of

Table 2
Descriptive statistics and reliability measures.

	Min	Max	M	SD	ρ	1st eigenval	2nd eigenval
Agreement Game	0	1.000	0.771	0.319	0.722	1.13	0.869
Conscientiousness Game	0	1.000	0.572	0.399	0.813	1.37	0.630
Extraversion Game	0	1.000	0.782	0.329	0.771	1.25	0.746
Neuroticism Game	0	1.000	0.506	0.408	0.797	1.32	0.676
Openness Game	0	1.000	0.730	0.349	0.761	1.23	0.773
Agreement Survey	1	5.000	3.508	0.904	0.799	1.33	0.669
Conscientiousness Survey	1.265	5.000	4.129	0.629	0.863	2.45	0.674
Extraversion Survey	1.000	5.000	3.512	0.802	0.862	2.44	0.779
Neuroticism Survey	1.000	5.000	3.065	0.855	0.821	1.82	0.676
Openness Survey	1.375	5.000	3.786	0.707	0.867	2.83	0.697

Table 3
Inter-construct correlations.

	1	2	3	4	5	6	7	8	9	10
1.Agreeableness Game	**0.750**									
2.Conscientiousness Game	−0.094	**0.827**								
3.Extraversion Game	−0.011	0.163	**0.791**							
4.Neuroticism Game	−0.027	−0.135	−0.171	**0.812**						
5.Openness Game	0.042	0.093	0.210	−0.102	**0.781**					
6.Agreeableness Survey	0.273	0.167	0.105	−0.074	0.090	**0.811**				
7.Conscientiousness Survey	0.014	0.345	0.080	−0.117	0.086	0.241	**0.782**			
8.Extraversion Survey	−0.073	0.133	0.273	−0.117	0.195	−0.007	0.279	**0.779**		
9.Neuroticism Survey	0.009	−0.234	−0.193	0.436	−0.023	−0.165	−0.250	−0.244	**0.776**	
10.Openness Survey	−0.056	0.181	0.133	−0.150	0.462	0.064	0.338	0.312	−0.113	**0.749**

Note: Square root of average variance extracted shown on the diagonal in bold.

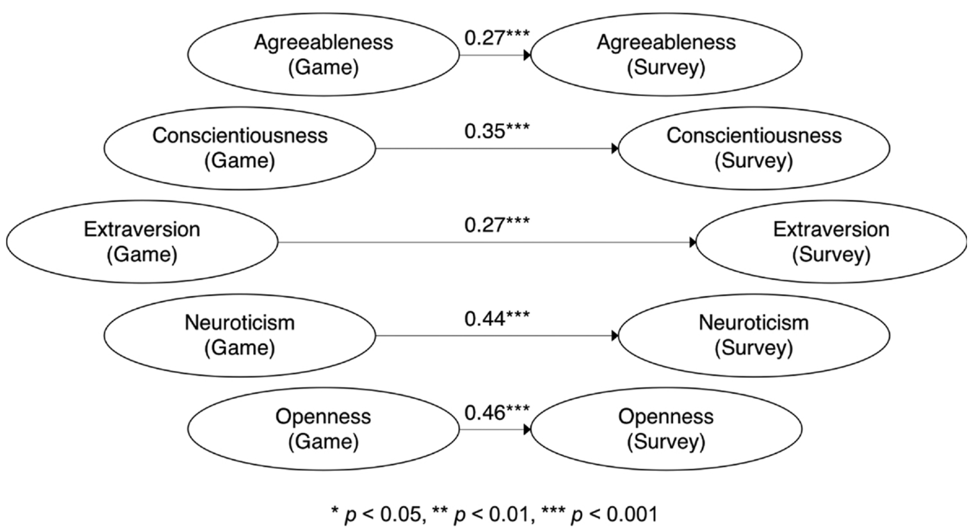

Fig. 4. Results of path analysis.

preference towards signaler (M = 0.692, SD = 0.429). Overall, 69% of respondents prefer an organization employing a gamified survey while 31% prefer an organization employing a traditional survey (Fig. 6).

The difference between the percentage of respondents preferring a signaler with a gamified survey vis-a-vis one with a traditional survey is significant ($t = 87.74$, $p < .001$), which lends support for H7. Thus, we conclude that organizations employing gamified surveys will be preferred over those employing traditional surveys. The summary of all results is reported in Table 6.

7. Discussion

Extant research has begun to explore the influence of gamification on online survey design (Cechanowicz et al., 2013; Harms et al., 2014; Mavletova, 2015). Despite these efforts, there is call for more systematic and empirical research in this area (Keusch & Zhang, 2017). This study responds to this call and investigates gamified surveys through the lens of signaling and the S-O-R framework. The focus of the present study is to understand the influence of certain game elements

Table 4
Descriptive statistics and reliability measures.

	Min	Max	M	SD	ρ	1st eigenval	2nd eigenval
Attitude Extrinsic Mechanism	1.000	5.000	3.523	1.156	0.854	1.49	0.510
Attitude Intrinsic Mechanism	1.000	5.000	3.420	1.173	0.828	1.41	0.586
Attitude Self-Presentation Mechanism	1.000	5.000	3.730	1.218	0.881	1.57	0.426
Affective Reactions Game	1.000	5.000	3.410	0.974	0.955	2.63	0.206
Cognitive Reactions Game	1.000	5.000	3.349	0.954	0.897	2.23	0.433
Affective Reactions Survey	1.000	5.000	3.251	0.937	0.937	2.49	0.295
Cognitive Reactions Survey	1.000	5.000	3.291	0.969	0.835	1.89	0.627
Preference Signaler	0	1.000	0.692	0.429	0.950	2.59	0.281

Table 5
Inter-construct correlations.

	1	2	3	4	5	6	7	8
1. Attitude Extrinsic Mechanism	**0.863**							
2. Attitude Intrinsic Mechanism	0.627	**0.841**						
3. Attitude Self-Presentation Mechanism	0.286	0.137	**0.887**					
4. Affective Reactions Game	0.313	0.348	0.185	**0.936**				
5. Cognitive Reactions Game	0.227	0.266	0.179	0.638	**0.860**			
6. Affective Reactions Survey	0.255	0.244	0.249	0.569	0.424	**0.909**		
7. Cognitive Reactions Survey	0.176	0.154	0.208	0.406	0.577	0.536	**0.697**	
8. Preference Signaler	0.094	0.065	0.011	0.234	0.099	0.034	0.036	**0.929**

Note: Square root of average variance extracted shown on the diagonal in bold.

on cognitive and affective reactions of the individuals, and evaluate the effect of these reactions on the preference of a signal. Using the S-O-R framework, we posit that enhancing a stimulus, such as a data collection survey instrument, with game elements influences the users' affective and cognitive states such as enjoyment and attention, and ultimately their attitudes towards the stimuli and a signaler (i.e. the person or organization that provides the signal).

A deeper analysis of the components of a gamified survey shows the contribution of each game element to promote organismic reactions. As game elements serve as a starting point to understand the effectiveness of gamification, we examined three types of game elements, namely extrinsic, intrinsic, and self-presentation, and their effects on cognitive and affective reactions of survey respondents. We found that extrinsic mechanisms, such as rewards, do not seem to affect cognitive reactions (i.e. attention towards the survey), but they do affect the enjoyment associated with the survey. At the same time, the effect of intrinsic mechanisms, such as constraints, is more pronounced and influences both cognitive and affective reactions. This finding can be explained by the nature of extrinsic mechanisms. It is known that although extrinsic incentives can induce initial actions and influence behavior (Liu et al., 2017), their effect decreases over time (Magni, Susan, & Venkatesh, 2010). In contrast, intrinsic mechanisms can be perceived as game elements that reflect skill improvement and mastery (Richter et al., 2015). The salience of intrinsic mechanisms vis-à-vis extrinsic ones is consistent with the recent emphasis on replacing extrinsic rewards with intrinsic motivations (Richter et al., 2015). With respect to self-presentation mechanisms, such as avatar, we found that its effect is significant for both cognitive and affective reactions. Allowing players to control their own presentation creates opportunities to become more invested in the game environment (Richter et al., 2015).

We found that cognitive reactions do not have a different impact on preference towards the signaler whether they are caused by gamification or by a traditional survey. Thus, it appears that cognitive reactions do not impact preference towards the signaler. However, our results suggest that affective reactions increase preference towards the signaler in both surveys, but the affective reactions caused by gamification have a stronger impact on preference towards the signaler than affective reactions caused by a traditional survey. According to S-O-R, cognitive reactions are a product of dealing with the existing information (Fang, 2014), while the emotional reactions reflect emotions such as satisfaction and happiness (Kamboj et al., 2018). As games are known to increase enjoyment and playfulness (Feng et al., 2018; Hamari & Koivisto, 2015; Von Ahn & Dabbish, 2008), the effect of game elements stimuli on affective reactions may be much stronger than on cognitive reactions.

Lastly, we found that there is a spillover effect from a survey to a signaler, which is an organization that provides the survey. The respondents in our study strongly preferred an organization behind a gamified survey thus supporting the premise that gamification serves as a positive signal. Signaling theory explains that certain signals can increase symbolic value of a signaling party that relates to the image and reputation of the signaler (Grover et al., 2018). The symbolic value can be observed from seeing gamification as technology innovation. In the context of the S-O-R framework, a signaler sends a positive differentiating signal by changing the stimulus by enhancing it with game elements, and then gains reputational effects.

7.1. Theoretical contributions

From the theoretical standpoint, this study integrates the behavioral

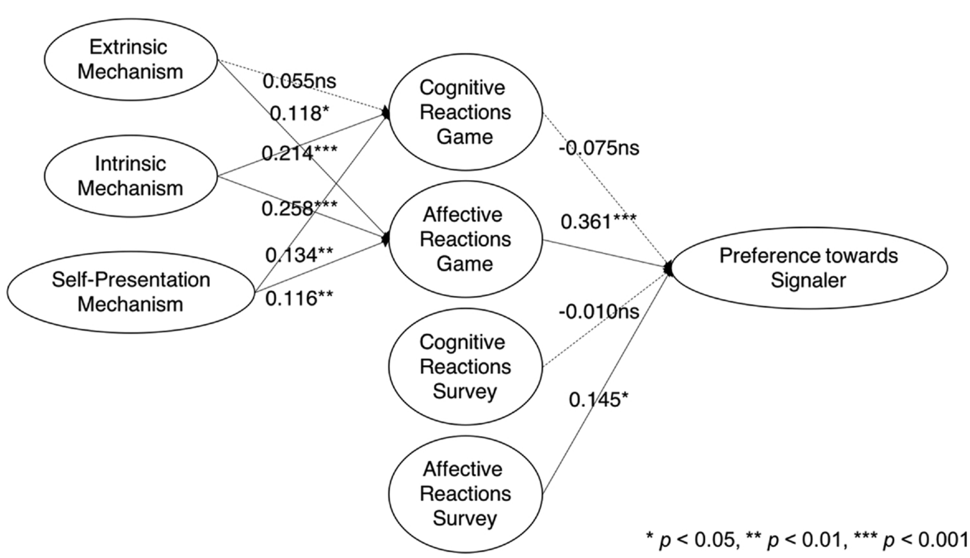

Fig. 5. Results of path analysis.

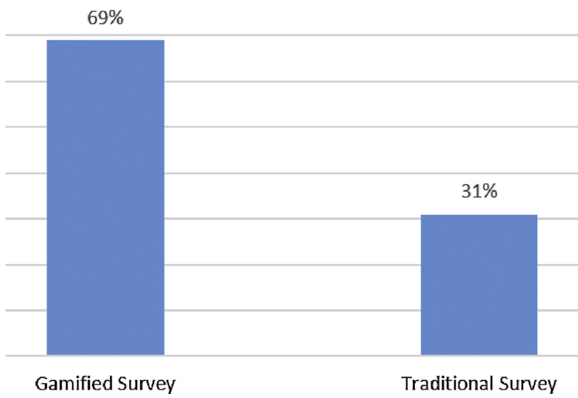

Fig. 6. Preference for Signaler.

S-O-R framework with signaling theory to evaluate the effect of gamification in a non-game context. By applying these two theoretical perspectives, we enrich the conceptual background for the domain of gamified surveys. An online survey, when enhanced with game elements, serves as a stimulus and affects the cognitive and affective states of individuals, consequently eliciting specific responses toward the signaling party. In addition, we tested game elements that are relevant in the design of gamified surveys.

To characterize further the nature of the stimulus, we conceptualized three types of game elements, extrinsic (rewards from the game to the user), intrinsic (internal to the design of the game such as time constrains), and self-presentation (mechanisms afforded to individual users to identify themselves). The articulation of these dimensions and their connections to different sources enhances our understanding of their impact from a theoretical standpoint. Given that the empirical studies on gamified surveys are sparse (Keusch & Zhang, 2017), this research expands on the underlying mechanisms whereby specific game elements influence cognitive and affective reactions of survey respondents.

As a result of mapping of specific game elements with their corresponding mechanisms, this research provides a detailed theoretical rationale to justify their effects on cognitive and affective reactions of respondents. Our integrated theoretical framework also provides the basis to understand the individual perceptions of a signaler. By linking the reactions of the respondents with the perceptions of the signaler, we are able to examine the effects of gamification for the sender (organization) and for the recipient (respondent) of the signal.

7.2. Practical contributions

The practical implications of our results are manifold. Understanding the gamification approach has the potential to improve the design of existing online systems across various organizational initiatives. Although the study is focused on a recruitment context, the results can be applied in marketing, brand management, social media strategy and other contexts that require user surveys. As the findings indicate that users prefer an entity that signals via gamified surveys, firms can selectively employ a strategy of gamifying surveys when warranted. With this approach, they would collect user reported data while at the same time reaping the benefits of sending a positive signal to customers. In addition, by observing the signalee's interaction with a gamified system, depending on the design of a survey, signalers may collect additional data about signalees unobtrusively, as respondents may behave differently than while answering traditional surveys.

Our findings indicate that affective reactions are much more salient than cognitive reactions in the perception of a signaler. This insight has implications for the decision of which instruments would benefit from gamification. If affective reactions are important, because the system will be used repeatedly by the individual, investing in gamification is likely to pay off. Additionally, from the types of game elements examined in the study, intrinsic mechanisms via constraints are more salient to increase the respondents' cognitive and affective reactions, when compared to extrinsic mechanisms such as rewards. Based on this finding, signalers may focus more on intrinsic mechanisms when designing gamified surveys.

Based on our results, gamification can be used as a signal to differentiate among signalers and communicate positive information about the signaler. This communication is helpful in reducing the information asymmetry between signalers and signalees. That is how gamification adds value. However, it is important to use gamification wisely by developing gamified experiences that elicit meaningful information and work well. Gamification for the sake of providing a game, or games that do not function reliably may tarnish the image of a signaler. Viewed as a presentation card, an organization should carefully evaluate the objectives of using gamification and thoroughly test it to ensure alignment its business objectives and strategic priorities.

8. Conclusion

By suggesting an alternative approach to user data collection through a gamified system, we tested the transformation of a typical interactive system into an immersive system. Our results indicate that gamification can serve as a positive signal, and gamified systems provide more user enjoyment than traditional systems do, without compromising the integrity of the data collected. Survey creators may find gamification to be a useful tool to deploy in their ongoing attempts to improve current online survey systems. For systems designers, in general, our study opens further avenues to modify current systems by adding playful experiences.

8.1. Limitations and future research

The results reported herein have limited generalizability due to the nature of the IT artifact, the context of the study, and the characteristics of the participant population. We custom-designed a novel gamified

Table 6
The results of hypotheses testing.

Hypothesis	Statistical Test	Supported
H1: Gamified survey > cognitive reactions	M_{diff} = 0.058, $p > 0.05$	No
H2: Gamified survey > affective reactions	M_{diff} = 0.159, $p < 0.001$	Yes
H3a: Extrinsic design mechanism > cognitive reactions	β = 0.055, SE = 0.057, $p > 0.05$	No
H3b: Extrinsic design mechanism > affective reactions	β = 0.118, SE = 0.056, $p < 0.05$	Yes
H4a: Intrinsic design mechanism > cognitive reactions	β = 0.214, SE = 0.055, $p < 0.001$	Yes
H4b: Intrinsic design mechanism > affective reactions	β = 0.258, SE = 0.054, $p < 0.001$	Yes
H5a: Self-presentation mechanism > cognitive reactions	β = 0.134, SE = 0.045, $p < 0.01$	Yes
H5b: Self-presentation mechanism > affective reactions	β = 0.116, SE = 0.044, $p < 0.01$	Yes
H6a: Cognitive reactions > signaler	$\Delta\beta$ = -0.065, $p > 0.05$	No
H6b: Affective reactions > signaler	$\Delta\beta$ = -0.506, $p < 0.001$	Yes
H7: Gamification > positive signal	t = 87.74, $p < .001$	Yes

system that proved to be enjoyable for participants. Other gamified systems with alternative designs may yield different results. Thus, future studies may focus on incorporating different designs and additional game elements. It is also advisable for future research to include additional experiments in different contexts to further evaluate the effectiveness of gamified surveys. Similarly, our subject population (college age students) may be particularly inclined to play games and prefer gamified environments, compared to other groups of participants. Nevertheless, many recruitment efforts are intended to attract millennials early as they join the workforce, and thus we view this demographic sample selection as a strength instead of a limitation of our results.

Finally, we evaluated the effect of gamification in online surveys via the lens of S-O-R framework and signaling, using attention and enjoyment as measurement tools. Future research may focus on further understanding of this phenomenon via other frameworks such as the ecological cognition framework (Bishop, 2009) that evaluates user participation in online activities. We welcome the efforts of future researchers to contribute with additional theoretical lenses or measurement tools to advance our understanding of this emerging phenomenon.

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