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Effects of Gamification Elements on Crowdsourcing Participation: The Mediating Role of Justice Perceptions

(Full Paper)

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ABSTRACT

Justice perceptions have been regarded as an important influencing factor for solvers' (i.e., users who solve tasks on the crowdsourcing platforms) continued participation in crowdsourcing. However, researchers and practitioners still lack of sufficient understanding on the design of crowdsourcing platform that can effectively foster solvers' justice perceptions. By synthesizing theory of organizational justice and the literature on gamification, we examine the effects of solvers' gamification element perceptions on their crowdsourcing participation through justice perceptions. Specifically, we propose a research model to explain the effects of three gamification element perceptions (i.e., point, feedback, social network) on solvers' distributive, interactional, and informational justice perceptions which, in turn, foster their crowdsourcing participation. By collecting survey data from 295 solvers and analyzing the data with the partial least squares-structural equation modeling (PLS-SEM) approach, our study finds that point fosters crowdsourcing participation through distributive and interactional justice. Feedback enhances participation through distributive, interactional and informational justice. While social network strengthens participation via interactional and informational justice. Our study offers significant theoretical contributions and practical implications for the gamified crowdsourcing and organizational justice literatures.

Keywords: Gamification, Crowdsourcing, Organizational Justice Theory, Distributive justice, Interactional Justice, Informational Justice, Point Perception, Feedback Perception, Social Network Perception

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INTRODUCTION

Crowdsourcing platforms are prevalent online cyberspaces where organizations can source their tasks from a large number of solvers (Ye *et al.*, 2017). As reported by the World Bank, the global crowdsourcing market reaped $2 billion revenue in 2013 and the number is estimated to reach between $15 billion and $25 billion by 2020. Crowdsourcing platforms enable firms to solve tasks with lower costs and collect consumer reviews about new products or services (Boons *et al.*, 2015). However, active solvers remain extremely low in such platforms. For instance, InnoCentive, a well-known crowd market, has only about 6,000 active solvers (approx. 1.6% of total registered solvers). A prominent reason for the lack of active participation in the crowdsourcing platforms is the insufficient justice perceived by the solvers, as evidenced in the crowdsourcing contests of Moleskine and Henkel (Faullant *et al.*, 2017). The Facebook page of Moleskine was occupied by thousands of negative comments from designers, customers and fans who are dissatisfied with the company's new incentive scheme for crowdsourcing, as this scheme only monetarily remunerated the winner. For another instance, Henkel, a company which held crowdsourcing contest for ideas, also received hundreds of complaints from the participants who are disappointed with the winner selection decision. And the contest winners felt that they were over-ruled.

Prior evidences demonstrated that in addition to monetary incentives, solvers also value fairness; and disappointment may occur because of perceived unfair treatment (Faullant *et al.*, 2017). It has been found that unfairness perceptions in crowdsourcing contests could stem from unfair reward allocations, nontransparent winner selection criteria, impolite atmosphere and disrespectful communication style (Franke *et al.*, 2013; Gebauer *et al.*, 2013). Specialized enterprises and their wage minimization have the function of increasing distributive fairness, enhancing transparency and resolving disputes from the source. The resolver's understanding of the terms and conditions of the crowdsourcing system, as well as the organization's distributive fairness and procedural fairness, can further influence their willingness to contribute to the organization. However, crowdsourcing research sheds little lights on how to build crowdsourcing platforms that can effectively attenuate solvers' perceived unfairness.

Gamification elements, for example points, badges, and leaderboard, have been regarded as effective non-monetary incentives within organizations (Mollick & Rothbard, 2014). It has been argued that gamification elements can act as non-monetary rewards that influence employees' justice perceptions, which further foster their organizational citizenship behaviors (Abdullah

& Wan, 2013). Applying this logic to the context of crowdsourcing, gamification elements might work as non-monetary incentives (Mekler *et al.*, 2017) that affect solvers' justice perceptions and promote their participation. However, there is scant research examining such potential effects. Without a nuanced understanding on the causal links among gamification elements, justice perceptions and solvers' participation, it would be difficult for crowdsourcing platform operators to properly develop gamification elements that enhance solvers' justice perceptions and foster their participation. Thus, this study aims to fill this gap by answering the research questions: *How do gamification elements affect solvers' justice perceptions and hence their participation in crowdsourcing?* Based on the organizational justice theory and the gamification literature, we develop a research model illustrating the impacts of solvers' perceptions about gamification elements on their crowdsourcing participation via justice perceptions. We propose that solvers' perceptions of three gamification elements, i.e., point, feedback, and social network will positively affect their distributive, interpersonal and informational justice perceptions, which in turn affect their crowdsourcing participation. In general, this study enriches the crowdsourcing literature by empirically examining the impacts of gamification on solvers' participation through their justice perceptions. It will also contribute to the gamification literature by offering a new angle of understanding the effects of gamification on user behaviors.

The remaining sections of this paper is organized as follows. Firstly, we introduce the theoretical background of this paper, i.e., the theory of organizational justice and the literature on gamification. Building on the theories, we propose our research model and hypotheses accordingly. Then, we describe the methodology as well as results of data analysis. Finally, we review and discuss our findings and offer both theoretical contributions and practical implications.

THEORETICAL BACKGROUND

Organizational Justice Theory

According to the theory of organizational justice, justice refers to perceptions of fairness and assessments on the adequacy of performance outcomes or processes (Cropanzano & Greenberg, 1997). Recently, theoretical development on this theory has focused on identifying and distinguishing diverse dimensions of justice such as distributive justice, procedural justice, interpersonal justice, informational justice (Greenberg, 1993). Distributive justice centers on assessing the fairness of the economic and social emotional outcomes that individuals receive, while procedural justice refers to the justice of the processes and procedures used to make decisions about the outcomes. Researchers extracted the interactive aspects of procedural justice and conceptualized them as interactional justice (Beth and Mog 1986). Later, the interactional justice was further divided into two subcategories (i.e. interactional justice and informational justice) (Greenberg, 1993). Interactional justice reflects whether the authority or superiors treat the subordinates with courtesy, whether they consider the dignity of the other party, and whether they respect each other in the execution of the procedures or the outcomes of the decisions. It emphasizes the fairness of interpersonal relationship that people feel during the execution of decision-making. Besides that, informational justice reflects the sufficiency of explanation behind the process and outcomes (Greenberg, 2001). It mainly refers to whether the information is conveyed to the parties. That is, to provide some explanations to the parties, such as why some form of procedure or why to distribute the results in a certain way (Greenberg, 2001).

The Organizational Justice Theory (OJT) mainly assumes that users with a high sense of justice will build trust and satisfaction in an uncertain organizational environment, thereby enhancing users' reciprocity and loyalty to the organization. Information systems researchers widely use OJT to analyze the individual's perceptions of justice when using information systems. Some research has been conducted from the perspective of justice to investigate online crowdsourcing participation. These studies focus on the effects of perceptual justice on the behavior and outcomes of solvers, such as creativity (Franke & Klausberger, 2009), product interest and perceived product innovation (Faullant *et al.*, 2017), and the efforts expended by solvers (Franke et al., 2013). For example, Zuo et al. (2015) proposes that the solvers' perceptions of distribution, procedures, and interactive justice have a positive impact on their creative performance, which is regulated by ideological cooperation and conceptual generation. Another example is Faullant et al. (2017). They found that solvers' justice perceptions can enhance their product interest, perceived innovation and loyalty intentions. However, relatively few studies have further explored the antecedents of justice perceptions. For example, Fieseler et al. (2017) conducted a qualitative survey of 203 solvers on Amazon Mechanical Turks, and put forth some suggestions for improving their sense of fairness. They found that the fairness of distribution can be improved with specialization and minimum compensation; increased transparency and resolved disputes. And worker representatives can increase both procedural justice and procedural justice; humanization can promote interaction equity. To give another example, Frank et al. (2013) based on two experimental simulations and argued that the crowdsourcing systems' terms and conditions and the prior identification level with the organization affect the solver's perception of distribution equity and procedural fairness, which in turn affects their willingness to contribute to the organization. In addition to these few studies, some studies suggest that gamification design elements may also affect fairness (Callan *et al.*, 2015; Mollick & Rothbard, 2014). In this study, we follow this research direction and explore the drivers of justice perceptions of solvers from the perspective of gamification design. We believe that gamification elements may play an effective role in enhancing solver's sense of justice.

Effects Of Gamification Elements On Solver Participation

For the definition of gamification, Deterding et al. systematically explained that the essence of gamification is "using game design elements in non-gaming situations" (Deterding et al. 2011). Gamification is used in the field of education at the very beginning. And its mechanism aims to improve students' enthusiasm for learning. Recently, information systems scholars adopted and developed the concept of gamification to design incentives for the use of information systems (Hamari et al.,

2016). They define gamification in information systems as using gamification design elements in information systems to improve or change an individual's attitudes and use of the system (Liu et al., 2017).

After gamification was introduced into information systems, academic research on gamification has surged. Koivisto & Hamari (2019) systematically analyzed 273 empirical studies and identified 47 different gamification affordances. They then divided these gamification affordances into several categories, among which three are most important (i.e., achievement, social, and immersion). The first "Achievement affordance" category includes gamification elements such as points, scores, missions, badge, leaderboards, levels, timer, feedback, etc. The second category concerns with social interaction elements, including social networking features, cooperation, teams, competition, etc. And the third "immersion affordance" category includes avatar, character, narrative, dialogues, theme, virtual world, 3D world, roleplay and other elements (Koivisto & Hamari, 2019) Subsequently, through the investigation of online gamified communities established by Xiaomi and Huawei, Xi & Hamari (2019) studied the effects of users' interaction with three types of gamification features (achievement-related, immersion-related and social-related features) on their intrinsic need satisfaction. Results of this study showed that when users interact with achievement-related and social-related features, their inherent needs for autonomy, competence and relatedness are more likely to be met. However, when users interact with immersion-related features, only self-satisfaction can be improved. Based on their findings, organizations should design different gamification features according to their business goals and targets of different consumer needs. For instance, education training institutions can improve user participation through constantly motivating the inner motivation of the participants and helping them form long-term study habits. In contrast, crowdsourcing platform can improve solvers' participation by offering additional incentives beyond monetary rewards, such as point, feedback, and social networks.

Gamification is also used in the context of online crowdsourcing to enhance the psychological and behavioral outcomes of the solvers (Morschheuser et al., 2017). To promote user engagement, a large number of gamification elements have been designed into the crowdsourcing platforms, such as points, feedback, badges, leaderboard, levels, and progress, etc. (Morschheuser et al., 2017). In general, the crowdsourcing platform equipped with gamification design is more popular among users. Previous research has pointed out that gamification elements can enhance the willingness of the solvers to continue to participate by affording their motivations (e.g., Feng et al. 2018; Goh et al. 2017). Motivations can be classified into intrinsic motivations and extrinsic motivations (Ryan & Deci, 2000). On the one hand, many studies have found that if gamification elements are added to the crowdsourcing platform, it can be seen as a design shifting participants from the completion of task to participation driven by intrinsic motivation (Deterding et al., 2011; Feng et al. 2018). Given that the success of crowdsourcing contests relies on a great number of participating solvers, the crowdsourcing platforms design inspiring elements to enhance participation by drawing on the ideas of the game. For example, Goh et al. (2017) found that reward points and badges can meet the motivational needs of autonomy and competence in mobile crowdsourcing. Similarly, Blohm & Leimeister (2013) found that providing points in crowdsourcing is a way to enhance participants' sense of mobility and immersion, further motivating them to complete tasks. Based on the perspective of motivational affordance, Feng et al. (2018) found the intrinsic needs of self-expression, self-efficacy, and playfulness can be met by both point and feedback elements, which further motivate the solvers to participate in micro-task crowdsourcing. Apart from that, some gamification elements are found to satisfy solvers' extrinsic needs for reputation or recognition, thereby stimulating their participation (Blohm & Leimeister, 2013). Studies have shown that various intrinsic and extrinsic motivations instigate people to join in crowdsourcing contests. For example, the intrinsic motivation engendered by the task design allows the participant to have the creativity and autonomy to develop his or her skills and sensory abilities. And in some cases, the extrinsic motivation for economic return can also be promoted. Specifically as an example, Zheng et al. (2011) discovered that individual's motivations can be enhanced by task complexity, task granularity, and task diversity (Zheng et al. 2011).

In addition to the widely accepted "gamification-motivation-behavior" logic, previous research suggests that some gamification elements (e.g., points, badges, leaderboard, social network) act as effective non-monetary incentives to compensate the solvers' efforts and improve their sense of fairness, thereby motivating them to make more contributions (Kawajiri et al., 2014). So it's an effective way to certify the solver's efforts through rewarding points. Badges and leaderboard also remunerate the efforts of solvers in a similar way. Apart from this traditional PBL-triad (i.e., points, badges, leaderboards), both positive and negative performance feedbacks from crowdsourcing firms can serve as useful mechanisms to recognize the solvers' efforts. Additionally, social networking on crowdsourcing platforms allows the solvers and crowdsourcing firms to communicate at any time, which makes the solvers feels respected. According to organizational justice theory, when employees feel that their employers treat them fairly, employees will commit to their organizations and conduct organizational citizenship behaviors (e.g., working hard) (Greenberg, 1993). In the context of crowdsourcing, as effective non-monetary incentives, gamification elements (e.g., points, feedback and social network) can be used by crowdsourcers to strengthen the solvers' sense of justice and maintain their participation. However, in both the gamification and crowdsourcing literature, few studies have attempted to link gamification elements to solvers' sense of justice and participation behaviors.

In the online crowdsourcing platform of the current study, we only choose the gamification elements of the achievement and social categories. There are two reasons why we only choose these two categories. First, the immersion category is more related to self-perceptions, rather than justice perceptions. Second, the gamification elements in the immersion category are not presented in this platform. In the platform we study, scores, missions, badges, leaderboard, and timer are not presented, and solver levels overlap with points as the levels are based on points earned. Therefore, we specifically choose to focus on point

and feedback for the achievement category. Besides, as individual solvers in this platform compete individually for the tasks, there are no team-based cooperation and competition among the solvers. Hence we select the social networking features for the social category. To sum up, in the current study, we pay special attention to points, feedback and social network, and empirically test their impacts on the solvers' sense of justice and participation behaviors.

Points are usually rewarded for successful completion of a given activity in a gamified environment and use numbers to represent the player's experience and abilities (Morschheuser et al., 2017). In this study, solvers will receive points when they participate and win the tasks. As the number of points is a key criterion for crowdsourcing firms to choose the winners of the tasks, points represent a type of non-monetary incentive, recognizing the effort and competence level of the solvers. Only when individuals pay attention to gamification elements can they work. Because individuals' perceptions are different, it is vital to conceptualize gamification elements as perceptions for the generalization of our research results. Therefore, we conceptualize the gamification elements as solvers' perceptions. *Point perception are defined as solvers' perceptions that the crowdsourcing platforms can effectively compensate their work with points*.

In addition to points, the crowdsourcing firms also provides feedback on the performance of the submissions (Ye & Kankanhalli, 2017). A normal crowdsourcing appeal typically receives up to thousands of submitted solutions. Therefore, crowdsourcing firms may not provide feedback to all the submissions. When receiving performance feedback from a crowdsourcing firm, whether it is positive or negative, the solver will feel that his efforts have been recognized by the company, thus forming a sense of fairness. Therefore, the feedback represents another non-monetary stimulus, which can enhance solvers' sense of justice. Therefore, *feedback perception is defined as the solvers' perception that the crowdsourcing platform allows them to receive performance feedbacks from the firms*.

Aside from points and feedback, social networking elements (e.g., live chat, in-mail) are also designed into the crowdsourcing platform. Social networks can promote low-cost information exchange and build meaningful social relationships among users. Communication and conversation can provide people with a stronger sense of connectivity and belonging**.** When solvers use social networks to build stronger social relationships with crowdsourcing firms, they are more motivated to accomplish tasks and perform well. For example, there is a live chat window in the platform, which is convenient for the crowdsourcing firms and the solvers to communicate the task requirements and progresses in real-time. This makes the solvers feel respected and feel interpersonal justice. And getting information from such channels also enhance the perception of informational justice as solvers would feel that they can access enough information before complieting the tasks. Combining the above, this study conceptualizes the perception of three gamification elements as point perception, feedback perception and social network perception, and tests their roles in stimulating solvers' participation through justice perceptions.

As far as the concept of justice is concerned, procedural justice involves the fairness of a decision-making process or procedure. Therefore, procedural justice is concentrated on the process of making the final decisions/results (Greenberg, 2001). These three gamification elements are related to either the outcome (i.e., points, feedback) or the requirements/progress debriefing (social network). Therefore, in this study, when we focus on points, feedback and social networking as three gamification elements in the crowdsourcing platform, we specifically focus on three dimensions of justice, namely, distribution justice, interactional justice and informational justice when studying the effects of gamification elements on solvers' participation.

RESEARCH MODEL AND HYPOTHESES

According to the organizational justice theory and gamification literature described above, we create a research model to illustrate the antecedents for solvers' participation in online crowdsourcing platforms as shown in Figure 1. Specifically, we conjecture that solvers' perceptions of point, feedback and social network elements positively affect their perceived distributive justice, interactional justice and informational justice, which, in turn, positively affect their crowdsourcing participation.

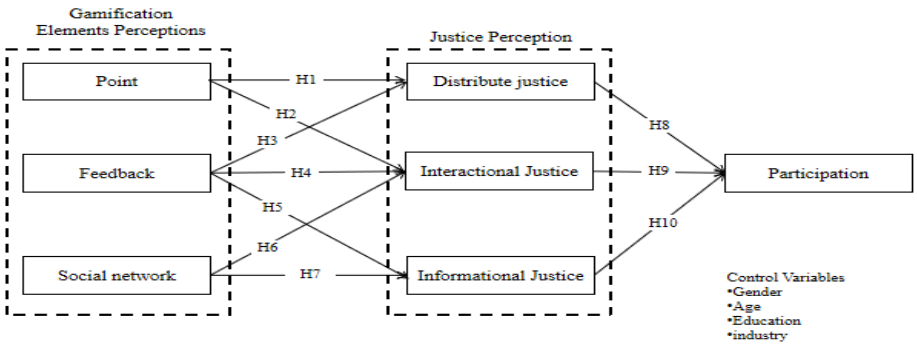

Figure 1: The Research Model

Point

As one of the most studied gamification elements in the literature, point is an achievement-related element. When solvers join crowdsourcing contests and win the bids, they will receive a number of points as virtual reward in addition to the monetary compensation. Based on a preponderance of managerial literature, providing virtual rewards is a significant part of employee compensation plan. Solvers typically devote massive efforts of time and energy to obtain the bids in the online crowdsourcing platform. Rewarding solvers with virtual incentives such as points show that the platform values the efforts of the solvers. Solvers' emotional efforts can be compensated by such virtual incentives. Hence, their perceptions of distributive justice will be reinforced. At the same time, when solvers receive points from the platform, they will feel that the platform treats them with respect and politeness, i.e., with interactional justice, hence being inclined to join in the tasks in the future. In addition, as a kind of incentive to give virtual currency, points are a reward for the solver who wins the task of the crowdsourcing platforms and gets a reward after completion. Information Justice focuses on the disclosure of the task requirements and evaluation information released by the solvers. Hence there is no connection between the former and the latter. Therefore, we speculate that,

H1: Point leads to higher perception of distributive justice by solvers.

H2: Point leads to higher perception of interactional justice by solvers.

Feedback

In addition to points, another achievement-related gamification element is performance feedback. After a crowdsourced task is completed and the winning bid (s) is selected, the crowdsourcing firm will be asked to offer clear and reasonable feedbacks to all the submissions, explaining the reasons why these submissions are/are not accepted. A large proportion of prior research has found that solvers have a normal expectation about receiving explanations for their failed submissions. Offering performance feedbacks fulfill such expectation and can enhance solvers' distributive justice. In the meantime, giving feedbacks also means that the crowdsourcing firm cares about the feeling of independent solvers and puts reasonable efforts to compensate them. Such behaviors will make solvers feel that they are treated with politeness, thereby developing a sense of interactional justice. Apart from that, when the selection criteria of the winning bids is rather ambiguous or subjective, the provision of performance feedbacks can at least make the final decision more "justifiable". Solvers will think that they have received enough information regarding the decision making criteria, hence generating the perception of informational justice. Hence, we expect that,

H3: Feedback leads to higher perception of distributive justice by solvers.

H4: Feedback leads to higher perception of interactional justice by solvers.

H5: Feedback leads to higher perception of informational justice by solvers.

Social Network

As discussed above, social networking features enabling the communication between the crowdsourcing firms and solvers can also enhance solvers' participation intention. When solvers have questions regarding the requirements and progress of the crowdsourcing tasks, they can employ the social networking tools in the platform to communicate with the crowdsourcing firms. Prompt and concise responses provided by crowdsourcing firms through such communication channels can foster solvers' perception of interactional justice. Similarly, when there are channels through which solvers can receive information on the task requirements and progress, they will feel that they possess equal information comparing to their peers, that is, higher perception of informational justice. On the other hand, Distributive Justice is the fairness between the solver's effort and reward in completing the task, that is, whether the reward obtained after completing the task conforms to his inner expectation. The Social Network is a way to enhance the interaction between the Crowdsourcing platforms and the solvers during the task execution process, thus it has no relationship with whether the effort and reward are equal. Therefore, we speculate,

H6: Social network leads to higher perception of interactional justice by solvers.

H7: Social network leads to higher perception of informational justice by solvers.

Distributive, Interactional And Informational Justice Perceptions

Literature on organizational justice has provided much evidence that justice perception has a clear impact on individuals' attitudes and behaviors. Individuals who feel that they are treated unfairly by employers will be disappointed, and such disappointment will foster their efforts to restore justice within the relationship; if not, individuals will decide to terminate the employment relationships (Greenberg, 1993). On the contrary, if individuals perceive that they are fairly treated, they will have more commitment on the employers and be proactive in their work. In the context of crowdsourcing, when solvers perceive that their contributions are fairly rewarded, i.e., distributive justice, they will be more active in task participation. Similarly, when solvers feel that they are treated with courtesy and politeness by the platform and crowdsourcing firms, i.e., interactional

justice, they will be more willing to contribute. Lastly, when solvers believe that they have received equal information as compared to other competitors, i.e., informational justice, they will sustain their participation in the future. Based on the above discussion, we speculate,

H8: Distributive justice perception is positively related to solvers' crowdsourcing participation.

H9: Interactional justice perception is positively related to solvers' crowdsourcing participation.

H10: Informational justice perception is positively related to solvers' crowdsourcing participation.

In order to control for potential bias from the sample selection, we include age, gender, education level and industry background as control variables in the model.

RESEARCH METHODOLOGY

We collect research data from the target population of a well-known Chinese micro-task crowdsourcing platform through online survey. Previous studies suggest that latent variables like the constructs in our theoretical model are best examined by the survey method (Kankanhalli et al., 2015). We must emphasize the fact that the online crowdsourcing platform in this study (i.e., Zhubajie.com) falls into the type of competition-based platform, as the majority of tasks in this platform are sourced by soliciting individuals to compete with one another by the crowdsourcing companies. A crowdsourced task might receive a large number of submissions from solvers. However, the crowdsourcing firms will only choose one or a few qualified submissions. Individual solver could obtain a certain amount of points if his or her submission is selected and financially rewarded. Solvers can utilize the social networking tools (i.e., live chat, in-mail) to communicate with the firms during the bidding process of crowdsourcing. In addition, the crowdsourcing firms can voluntarily give performance feedbacks and evaluations to every single submission for their crowdsourced tasks. In general, tasks crowdsourced in this platform fall under the category of "easy task with high outcome variety". Tasks include translation, Website design, as well as logo design, which require the solvers have a certain amount of creativity and specialized knowledge.

Sample

The method of gathering data in this study is sending invitation via private message to registered solvers of the crowdsourcing platform. The message included an invitation note and a hyperlink to the questionnaire posted in an online survey website (www.wenjuan.com). We acquire a full list of registered solvers from the platform operator and randomly pick out 1,000 individuals from the list. Then we send the invitational private messages to them. Altogether, 326 solvers responded to the survey request, which leads to a response rate of 32.6%. After removing those incomplete and repeated responses, 295 questionnaires in total were selected for data analysis. Table 1 reported the demographic information of the selected samples.

Table 1: Demographics of the Samples

Variable	Item	Frequency	Percentage (%)
Age	< 18	1	0.3
	18-24	96	32.5
	25-35	180	61.0
	36-50	17	5.8
Gender	Male	169	57.3
	Female	126	42.7
Education level	High school and below	19	6.4
	College	90	30.5
	University	169	57.3
	Master	16	5.4
	PhD	1	0.3
Industry	Education	61	20.7
	IT service	75	25.4
	Manufacturing	40	13.6
	Financial service	9	3.1
	Traditional services	42	14.2
	Others	68	23.0

Measures

Where applicable, the constructs in the research model were operationalized by adapting existing items from prior literature to ensure validity. Otherwise, new items were developed by referring to the constructs' definitions in previous gamification literature and interviews with subjects. Table 2 shows the survey items for all the constructs.

Table 2: Operationalization of Constructs in the Model

Constructs		Items	Source
Point (PNT)	PNT1	This platform increases my points in correspondence to my behaviors (e.g., submission, winning the bids)	Adapted from (Feng, 2018)
	PNT2	This platform promptly evaluates my behaviors and add up my points	
	PNT3	Points is a critical measure for the competence level of solvers in this platform	
Feedback (FEB)	FEB1	This platform enables the crowdsourcing firms to provide thanks to my submissions	Adapted from (Feng, 2018)
	FEB2	This platform enables the crowdsourcing firms to review my submissions	
	FEB3	This platform allows the crowdsourcing firms to guage the quality of my submission (i.e., good, normal, or bad)	
Social network (SOC)	SOC1	The social system in the crowdsourcing platform allows me to see the activities of other users	Adapted from (Feng, 2018)
	SOC2	The social system in the crowdsourcing platform allows me to communicate with crowdsourcing firms effectively	
	SOC3	The social system of the crowdsourcing platform satisfies my social needs	
	SOC4	The social system of the crowdsourcing platform allows me to communicate with crowdsourcing firms promptly	
Distributive justice (DIS)	DIS1	What I obtain from this platform is fair compared to the efforts I have made	Adapted from (Colquitt, 2001)
	DIS2	What I obtain from this platform is fair compared to the activeness of my response to the crowdsourcing firms' requests	
	DIS3	What I obtain from the platform is fair compared to the speed of response to the crowdsourcing firms' requests	
	DIS4	What I obtain from the platform is fair compared to the time and efforts I devote to completing the tasks	
Interpersonal justice (INT)	INT1	I am treated politely in this platform	Adapted from (Colquitt, 2001)
	INT2	I am treated kindly in this platform	
	INT3	I am treated with respect in this platform	
	INT4	My membership rights are attended and valued in this platform	
Informational justice (INF)	INF1	The crowdsourcing firms can concretely explain the task requirements	Adapted from (Colquitt, 2001)
	INF2	The crowdsourcing firms can communicate with solvers about the task requirements frankly	
	INF3	The crowdsourcing firms can inform me about the details of task requirements promptly	
Solver participation (PAR)	PAR1	I plan to actively join in the crowdsourcing tasks of this platform	Adapted from (Wu & Sukoco, 2010)
	PAR2	I plan to actively join in the tasks of this platform in the future	
	PAR3	I will do my best to participate in tasks in this platform, rather than leaving it	
	PAR4	I will keep a relatively high level of participation in this platform in the future	

To ensure the validity of the newly-developed survey items (i.e., items for point, feedback and social network), we conducted exploratory interviews with 8 crowdsourcing solvers to find out how they recognized and perceived the gamification features when using this crowdsourcing platform. We also launched a pilot test with 40 participants to validate the new items. By referring to Moore and Benbasat (1989), we went through a two-stage Q-sorting process to enhance the content validity, convergent validity and discriminant validity of all the items. All the items were measured with 5-points Likert-scales anchored from "strongly disagree" to "strongly agree" (See Table 2) Items in English were translated into Chinese and given to six information systems researchers who were competent in both languages to translate them back to English. Then we carefully compared the two versions of English items and resolved all the conflicting issues by revising the wording of the items.

RESULTS

In this study, we employed Partial least squares (PLS) to analyze the survey data. PLS-SEM instead of co-variance based SEM is suitable for analyzing the model with latent variables (Wetzels et al., 2009). Bootstrapping was adopted to test the statistical significance of path coefficients according to Wetzels et al. (2009). In the research model, all constructs were modeled as reflective. We used SmartPLS2.0 for data analysis.

The Measurement Model

Convergent validity is tested by measuring the (1) reliability of items, (2) composite reliability of constructs (>0.7), (3) average variance extracted (AVE) (>0.5), and (4) factor analysis results. Reliability of items is guaranteed by checking each item's loading on its related construct (Standardized Factor Loading > 0.7). In the current study, all the item loadings satisfy this criterion (see Table 3). Cronbach's alpha scores (CA) and composite reliability scores (CR) for every construct (see Table 4) are well above 0.70, which is the recommended benchmark for acceptable internal reliability. Table 4 indicate that the AVE score for every construct, ranging from 0.73 to 0.79, far exceeding the suggested value of 0.50. In addition, all the items highly loaded on their own constructs (with the minimum loading of 0.68), thereby showing good convergent validity (see Table 3).

Table 3: Factor Analysis Results

	1	2	3	4	5	6	7
PNT1	0.19	0.16	0.15	0.18	0.23	**0.77**	0.05
PNT2	0.15	0.07	0.13	0.19	0.22	**0.77**	0.27
PNT3	0.20	0.16	0.16	0.14	0.16	**0.78**	0.19
FEB1	0.17	0.12	0.20	0.15	**0.78**	0.24	0.02
FEB2	0.13	0.14	0.09	0.12	**0.83**	0.21	0.14
FEB3	0.16	0.12	0.17	0.12	**0.77**	0.11	0.16
SOC1	0.08	0.15	**0.76**	0.27	0.08	0.18	0.01
SOC2	0.18	0.28	**0.75**	0.12	0.16	0.09	0.18
SOC3	0.14	0.14	**0.79**	0.16	0.15	0.06	0.18
SOC4	0.02	0.24	**0.79**	0.16	0.14	0.16	0.22
DIS1	0.14	**0.79**	0.20	0.20	0.10	0.11	0.18
DIS2	0.14	**0.76**	0.20	0.19	0.07	0.15	0.25
DIS3	0.12	**0.81**	0.21	0.19	0.14	0.09	0.12
DIS4	0.15	**0.76**	0.17	0.24	0.14	0.09	0.10
INT1	0.20	0.18	0.22	**0.69**	0.17	0.21	0.21
INT2	0.16	0.21	0.22	**0.72**	0.17	0.13	0.21
INT3	0.13	0.26	0.14	**0.80**	0.09	0.11	0.14
INT4	0.12	0.27	0.24	**0.70**	0.11	0.17	0.22
INF1	0.14	0.23	0.19	0.24	0.20	0.18	**0.76**
INF2	0.16	0.24	0.27	0.25	0.08	0.20	**0.72**
INF3	0.21	0.26	0.19	0.30	0.15	0.21	**0.68**
PAR1	**0.85**	0.15	0.06	0.17	0.12	0.12	0.07
PAR2	**0.83**	0.12	0.16	0.10	0.08	0.15	0.06
PAR3	**0.81**	0.09	0.06	0.20	0.17	0.04	0.12
PAR4	**0.83**	0.13	0.09	0.02	0.10	0.21	0.15
Eigenvalue	10.59	2.25	1.70	1.37	1.23	1.06	0.88
% of variance	42.37	8.99	6.81	5.48	4.92	4.24	3.51
Cumulative%	42.37	51.36	58.17	63.65	68.56	72.80	76.32

Table 4: Means, Standard Deviations, Scale Reliabilities, and Inter-Construct Correlations

Variable	Mean	SD	CA	CR	AVE	PAR	DIS	INT	INF	PNT	FEB	SOC
PAR	4.03	0.73	0.90	0.93	0.76	0.87						
DIS	3.69	0.79	0.89	0.92	0.75	0.39	0.87					
INT	3.90	0.64	0.88	0.92	0.73	0.43	0.61	0.85				
INF	3.79	0.72	0.87	0.92	0.79	0.43	0.60	0.66	0.89			
PNT	3.94	0.68	0.85	0.91	0.77	0.44	0.42	0.52	0.56	0.88		
FEB	4.06	0.76	0.84	0.90	0.76	0.39	0.39	0.53	0.45	0.54	0.87	
SOC	3.70	0.74	0.88	0.92	0.73	0.33	0.55	0.57	0.43	0.44	0.43	0.85
Notes: Diagonal elements are the square root of the average variance extracted (AVE) SD, standard deviation; CA, Cronbach's alpha; CR, composite reliability												

We assessed discriminant validity by detecting the item-construct loadings and inter-construct correlations. Table 3 outlines the fact that all items more strongly load on their related constructs than on other constructs. As shown in Table 4, the square

roots of the average variance extracted (AVE) are greater than the inter-construct correlations. Consequently, the constructs demonstrate strong discriminant validity.

Finally, the extent of common method variance (CMV) is assessed by using the marker-variable technique. then we examined correlations between the marker variable and other constructs as the marker variable utilized was fantasizing and theoretically unrelated. Several prior studies (e.g., Ye & Kankanhalli, 2017; Feng *et al.*, 2018) had employed fantasizing as marker variable, and showed positive validity in examining CMV. In this study, the smallest correlation with fantasizing was -0.03 ($p>0.05$), indicating that CMV was not a substantial issue.

Hypothesis Testing

As figure 2 and table 5 shown, demographic variables (i.e., age, gender, education level and industry) were included in the analysis as controls for solver participation. None of the control variables except for gender ($\beta=0.12$, $p<0.01$) were significant, implying that female is more willing to participate in crowdsourcing than male.

It's consistent with our prediction that point shows a significant influence on distributive justice ($\beta=0.292$, $p<0.001$), supporting H1. Point also exhibits a positive influence on interactional justice ($\beta=0.297$, $p<0.001$), supporting H2. As anticipated, the relationship between feedback and distributive justice ($\beta=0.235$, $p<0.001$), interactional justice ($\beta=0.138$, $p<0.001$) and informational justice ($\beta=0.253$, $p<0.001$) are significant respectively, supporting H3, H4 and H5. Social network is also favorable related to both interactional justice ($\beta=0.381$, $p<0.001$) and informational justice ($\beta=0.454$, $p<0.001$), supporting H6 and H7. Consistent with our prediction, distributive justice ($\beta=0.143$, $p<0.001$), interactional justice ($\beta=0.203$, $p<0.001$) and informational justice ($\beta=0.205$, $p<0.001$) all exhibit positive relationship with solvers' participation, supporting H8, H9 as well as H10. Table 5 summarizes the results of the hypothesis tests.

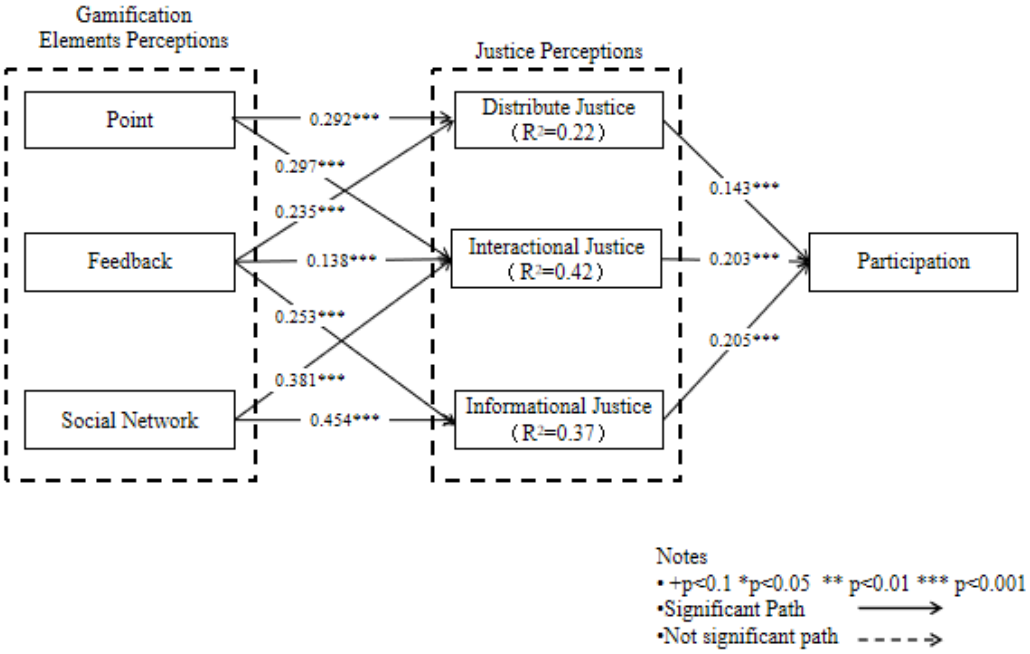

Figure 2: Hypothesis Testing Result

Table 5: Tests of Research Hypotheses

Proposed paths				Path estimate	*p*-levels	Result
H1	PNT	→	DIS	0.294	<0.001	**Support**
H2	PNT	→	INT	0.279	<0.001	**Support**
H3	FEB	→	DIS	0.235	<0.001	**Support**
H4	FEB	→	INT	0.138	<0.001	**Support**
H5	FEB	→	INF	0.253	<0.001	**Support**
H6	SOC	→	INT	0.381	<0.001	**Support**
H7	SOC	→	INF	0.454	<0.001	**Support**
H8	DIS	→	PAR	0.143	<0.001	**Support**
H9	INT	→	PAR	0.203	<0.001	**Support**
H10	INF	→	PAR	0.205	<0.001	**Support**

Post-hoc Mediation Analysis

We conduct multiple regression analyses to assess each component of the proposed mediation model. Results are shown in Table 6. First, it was found that point, feedback, and social network are positively related to participation. Second, distributive justice, interactional justice and informational justice were found to be positively related to participation. Third, point is positively related to distributive and interactional justice while feedback is positively related to distributive, interactional and informational justice. Furthermore, social network is positively related to interactional and informational justice.

Table 6: Bootstrapping Test for Indirect Effects (Sample size= 295)

Relations		Coefficient	*t*-statistics	Bootstrapping β	Confidence Interval (95%)	
					Lower	Upper
Independent Variable-> Mediator (a path)	PNT->DIS	0.490	7.913***			
	PNT->INT	0.490	10.376***			
	FEB->DIS	0.436	7.312***			
	FEB->INT	0.404	8.602***			
	FEB->INF	0.460	8.635***			
	SOC->INT	0.489	11.669***			
	SOC->INF	0.554	11.664***			
Mediator-> Dependent Variable (b path)	DIS->PAR	0.144	2.440*			
	INT-> PAR	0.210	2.704**			
	INF-> PAR	0.243	3.345**			
Independent Variable-> Dependent Variable (c path)	PNT->PAR	0.474	8.412***			
	FEB->PAR	0.402	7.326***			
	SOC->PAR	0.328	6.033***			
Independent Variable-> Dependent Variable (c' path)	PNT->PAR	0.301	4.695***			
	FEB->PAR	0.209	3.503***			
	SOC->PAR	0.068	1.046			
Mediating Effects	PNT->DIS->PAR			0.071	0.020	0.149
	PNT->INT->PAR			0.103	0.028	0.199
	FEB->DIS->PAR			0.045	0.002	0.106
	FEB->INT->PAR			0.070	0.005	0.160
	FEB->INF->PAR			0.079	0.013	0.165
	SOC->INT->PAR			0.126	0.041	0.238
	SOC->INF->PAR			0.135	0.047	0.246

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As both a-path and b-path were significant, we used the Bootstrapping method with bias-corrected confidence estimates (Preacher & Hayes, 2008) to verify the mediation effects. In the current study, the 95% confidence interval of the indirect effects was obtained with 5000 bootstrap re-samples (Preacher & Hayes, 2008). Results of the mediation effect analysis confirmed the mediating role of distributive justice (*Beta* = 0.071, CI = 0.020-0.149) and interactional justice (*Beta* = 0.103, CI = 0.028-0.199) in the relation between point and participation; the mediating role of distributive justice (*Beta* = 0.045, CI = 0.002-0.106), interactional justice (*Beta* = 0.070, CI = 0.005-0.160), and informational justice (*Beta* = 0.079, CI = 0.013-0.165) in the relation between feedback and participation; and the mediating role of interactional justice (*Beta* = 0.126, CI = 0.041-0.238) and informational justice (*Beta* = 0.135, CI = 0.047-0.246) in the relation between social network and participation. In addition, results indicate that the direct effects of point (*Beta* = 0.474, t = 8.412) and feedback (*Beta* = 0.402, t = 7.326) on participation remained significant (point: *Beta* = 0.301, t = 4.695; feedback: *Beta* = 0.209, t = 3.503) when controlling for the mediators, hence suggesting partial mediations, while the direct effect of social network on participation (*Beta* = 0328, t = 6.033) became non-significant (*Beta* = 0.068, t = 1.046) when controlling for the mediators, thereby suggesting full mediations.

DISCUSSIONS

Nowadays, commercial organizations heavily count on online crowdsourcing platforms to search for effective solutions and creative ideas (Ye & Kankanhalli, 2017). Instigating solvers to participate is an important pre-requisite for the sustainability of these crowdsourcing platforms (Ye & Kankanhalli, 2017). Solvers, like workers, will be more proactive in task solving when they perceive they are fairly treated. Therefore, how to properly design the platform to nurture the fairness perceptions of solvers and motivate their participation is an important but insufficiently studied topic for both researchers and practitioners. Considering this, we seek to investigate how to utilize gamification to generate solvers fairness perception and participation. Empirical results support our hypotheses that the perceptions of three typical gamification elements (i.e., point, feedback and social network) positively affect solvers' participation via their justice perceptions. Specifically, point affects participation through the distributive and interactional justice perceptions, while feedback influences participation through distributive, interactional, and informational justice perceptions. Additionally, social network has an effect on participation via interactional and informational justice perceptions. Taken together, results of this study suggest that gamification elements indirectly

influence solvers' engagement in crowdsourcing tasks through the distributive, interactional, and informational justice perceptions.

Theoretical Contributions

This study has several critical theoretical contributions. First, we develop the gamified crowdsourcing literature (Goh et al., 2017) by theorizing gamification elements into point perception, feedback perception and social network perception, and testing their effects on solvers' justice perceptions and participation. This provides an effective research example for future study on the effects of gamification artifacts.

Second, past empirical literature on gamification has overwhelmed by research on the impacts of gamification elements on solvers' behaviors via motivations (Mekler et al., 2017). Although prior research has inferred that some gamification artifacts may work as non-monetary incentives that supplement the monetary rewards in compensating solvers' efforts and enhancing their fairness perceptions (Mekler et al., 2017), little research has empirically examined the effects of gamification artifacts on solvers' behaviors via their justice perceptions. This study adds up to previous gamification literature by theoretically proposing and empirically justifying the impacts of gamification element perceptions on solvers' participation through their justice perceptions in the crowdsourcing platforms. Results suggest that in crowdsourcing platforms, point, feedback and social network can foster solvers' participation via their distributive, interactional, and informational justice perceptions.

Third, prior crowdsourcing research has been restricted to studying the effects of different justice perceptions on solvers' engagement (Faullant et al., 2017). This study enriches existing crowdsourcing literature (Franke et al., 2013) by stepping further to explore and examine platform designs as antecedents for justice perceptions. Specifically, we conceptualize point, feedback and social network as three typical gamification elements perceptions and bridge them with the distributive, interactional, and informational justice perceptions of the solvers. This inspires our understanding on how the design of crowdsourcing platforms can be tuned to compensate the solvers' efforts and motivate them to participate.

Fourth, this study enriches the literature on organizational justice theory by establishing the theoretical links between organizational justice theory and gamification literature. As a result, we identify three gamification artifacts as the critical sources for solvers' distributive, interactional and informational justice perceptions. This adds to the development of organizational justice theory.

Practical Implications

From a pragmatic perspective, we generate insights to crowdsourcing organizations and platform operators on how to promote solvers' participation. Specifically, this study enlightens practice in three ways. First, it suggests that designing an effective pointstification system can encourage solvers to more actively participate in crowdsourcing. On one hand, this study implies that a fine-tuned pointstification system should be able to motivate solvers' participation in crowdsourcing by reinforcing their distributive justice perception, that is, the evaluation of fairness of economic and socio-emotional outcomes they receive. Crowdsourcing platforms should promote to solvers the notion that earning more points could be regarded by crowdsourcing firms as competent solvers and thus bringing more chances to win the bids. When solvers consider the points as valuable non-monetary incentives, they will believe that their emotional efforts are properly compensated and thus are more willing to sustain their participation. On the other hand, empirical evidences of this study also indicate that rewarding solvers with points immediately after the tasks are completed could make them feel they are politely treated, thereby being more proactive in task participation.

Second, real-time performance feedback by crowdsourcing firms is also important. Crowdsourcing platforms could strive to enhance solvers' distributive, interactional, and informational justice perceptions by urging the crowdsourcing firms to provide immediate and detailed feedbacks for the submissions. Specifically, crowdsourcing firms should be encouraged to reply to as many as the submissions immediately after the task is completed. To realize that, crowdsourcing platforms should devise a function to remind the firms to select bids and offer feedbacks when the bidding period is ended. Additionally, crowdsourcing firms should be encouraged to be constructive when they provide feedbacks. Prompt and constructive feedbacks can reinforce solvers' sense of distributive, interactional and informational justice which, in turn, enhance their crowdsourcing participation.

Third, to strengthen solvers' justice perceptions, multi-channel social networking tools for the effective communication between crowdsourcing firms and solvers are indispensable. To be concrete, crowdsourcing platforms should be able to offer various networking tools (i.e., instant messaging, in-mail) for solvers to communicate with firms before they participate in the tasks. And these social networking tools should be noticeable and easy to use.

Limitations and Future Research Directions

We acknowledge some limitations in this study. First, divergent from prior studies that commonly adopted an experimental approach to examine the effects of gamification artifacts, we examine such effects through a cross-sectional survey, which bears its own merits. Although the experimental method might be more capable in justifying the causal relationships among studied variables, the external validity and generalizability of the findings might be compromised. On contrary, survey could enhance the external validity and generalizability to a certain extent. Apart from that, in this study we operationalized the two

gamification elements as solvers' perceptions, which are latent variables and are best studied with survey method (Kankanhalli et al., 2015).

Second, as different types of crowdsourcing tasks require different amounts of efforts by the solvers, for tasks that are more complicated or large-sized, solvers have to devote a greater amount of time and efforts to complete them (Ye & Kankanhalli, 2017). In this situation, efforts can never be accurately measured and compensated by monetary rewards, solvers may value more on non-monetary incentives and place more emphasis on emotional and interpersonal fairness of the deals. Hence, our findings might be best generalized to large-sized or complicated tasks. We acknowledge that for small-sized or less complicated tasks, solvers might value less on the non-monetary incentives and care more about the immediate monetary rewards. Future research replicating our study should at least take the size and complexity of the crowdsourcing tasks into consideration.

Third, although we carefully select pertinent variables into our model based on theoretical foundations, we cannot exclude a possibility of omitting relevant variables. For example, our model focuses on three main dimensions of justice (distributive, interactional and informational justice). Organizational justice literature suggests that there are another dimensions of justice (i.e., procedural justice). We did not include this dimension in our model because we contemplated that points and feedbacks are not related to processes leading to the selection outcomes, about which these two dimensions of justice concern. However, we acknowledge that some crowdsourcing firms might still incorporate explanations of their selection processes in their performance feedback, which could influence the procedural justice perceptions as well. Future research should also account for this possible link.

This study creates a number of exciting directions for further research. This study confirms the significance of three typical gamification artifacts in enhancing solvers' justice perceptions and participation. However, there is still a range of gamification artifacts used in crowdsourcing platforms of which the working paths remain unknown. We solicit researchers to examine other gamification artifacts (e.g., badges, leaderboard) that might be of the equal importance to solvers' justice perceptions and participation in online crowdsourcing platforms.

CONCLUSIONS

Despite various regulations and promotions applied, solvers' participation keep on shirking in online crowdsourcing platforms. Bearing in mind the importance of solvers' engagement, practitioners have dwelled into the search for various measures to encourage participation. To this end, we offer a theory-driven piece of work to evaluate the importance of gamification elements in assisting practitioners to enhance the prosperity of crowdsourcing platforms via distributive, interactional and informational justice perceptions. Our findings offer clear empirical evidences that the synthesis of gamification literature and organizational justice theory is crucial for a nuance understanding of solvers' crowdsourcing participation. We believe that the theoretical model examined in this study can lay a solid foundation for future research endeavors in this important area.

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REFERENCES

Abdullah, A. A., & Wan, H. L. (2013). Relationships of non-monetary incentives, job satisfaction and employee job performance. *International Review of Management and Business Research, 2(4)*, 1085-1091.

Blohm, I., & Leimeister, J. M. (2013). *Gamification. Business & Information Systems Engineering, 5(4),* 275-278.

Boons, M., Stam, D., & Barkema, H. G. (2015). Feelings of pride and respect as drivers of ongoing member activity on crowdsourcing platforms. *Journal of Management Studies, 52(6),* 717-741.

Callan, R. C., Bauer, K. N., & Landers, R. N. (2015). How to avoid the dark side of gamification: Ten business scenarios and their unintended consequences. *In Gamification in Education and Business* (pp. 553-568). Springer, Cham.

Colquitt, J. A. (2001). On the dimensionality of organizational justice: A construct validation of a measure. *Journal of Applied Psychology, 86(3),* 386-400.

Cropanzano, R., & Greenberg, J. (1997). Progress in organizational justice: Tunneling through the maze. *International Review of Industrial and Organizational Psychology, 12*, 317-372.

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011, September). From game design elements to gamefulness: Defining gamification. *In Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments* (pp. 9-15). ACM, Tampere, Finland.

Faullant, R., Fueller, J., & Hutter, K. (2017). Fair play: Perceived fairness in crowdsourcing competitions and the customer relationship-related consequences. *Management Decision, 55(9),* 1924-1941.

Feng, Y., Ye, H. J., Yu, Y., Yang, C., & Cui, T. (2018). Gamification artifacts and crowdsourcing participation: Examining the mediating role of intrinsic motivations. *Computers in Human Behavior, 81(4),* 124-136.

Fieseler, C., Bucher, E., & Hoffmann, C. P. (2017). Unfairness by design? The perceived fairness of digital labor on crowdworking platforms. *Journal of Business Ethics, 12(2),* 1-19.

Franke, N., Keinz, P., & Klausberger, K. (2013). "Does this sound like a fair deal?": Antecedents and consequences of fairness

expectations in the individual's decision to participate in firm innovation. *Organization Science, 24(5)*, 1495-1516.

Franke, N., & Klausberger, K. (2009). The role of perceived fairness in company-centred crowdsourcing communities. *Vienna University of Economics and Business Administration*.

Gebauer, J., Füller, J., & Pezzei, R. (2013). The dark and the bright side of co-creation: Triggers of member behavior in online innovation communities. *Journal of Business Research, 66(9),* 1516-1527.

Goh, D. H. L., Pe-Than, E. P. P., & Lee, C. S. (2017). Perceptions of virtual reward systems in crowdsourcing games. *Computers in Human Behavior, 70(5),* 365-374.

Greenberg, J. (1993). Stealing in the name of justice: Informational and interpersonal moderators of theft reactions to underpayment inequity. *Organizational Behavior and Human Decision Processes, 54(1),* 81-103.

dying organizational justice cross-culturally: Fundamental challenges. *International Journal of Conflict Management, 12(4),* 365-375.

Hamari, J., Shernoff, D. J., Rowe, E., Coller, B., Asbell-Clarke, J., & Edwards, T. (2016). Challenging games help students learn: An empirical study on engagement, flow and immersion in game-based learning. *Computers in Human Behavior, 54(1),* 170-179.

Kankanhalli, A., Ye, H., and Teo, H. H. (2015). Comparing potential and actual innovators: An empirical study of mobile data services innovation. *MIS Quarterly, 39(3),* 667-682.

Kawajiri, R., Shimosaka, M., & Kashima, H. (2014, September). Steered crowdsensing: Incentive design towards quality-oriented place-centric crowdsensing. *In Proceedings of the 2014 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (pp. 691-701). ACM, Seattle, Washington, USA.

Koivisto, J., & Hamari, J. (2019). The rise of motivational information systems: A review of gamification research . *International Journal of Information Management*, *45,*191-210.

Liu, D., Santhanam, R., & Webster, J. (2017). Toward meaningful engagement: A framework for design and research of gamified information systems. *MIS Quarterly, 41(4),* 105-125.

Mekler, E. D., Brühlmann, F., Tuch, A. N., & Opwis, K. (2017). Towards understanding the effects of individual gamification elements on intrinsic motivation and performance. C*omputers in Human Behavior, 71(6),* 525-534.

Mollick, E. R., & Rothbard, N. (2014). Mandatory fun: Consent, gamification and the impact of games at work. *The Wharton School research paper series.*

Morschheuser, B., Hamari, J., Koivisto, J., & Maedche, A. (2017). Gamified crowdsourcing: Conceptualization, literature review, and future agenda. *International Journal of Human-Computer Studies, 106(10),* 26-43.

Preacher, K. J., and Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models, *Behavior Research Methods 40*(3), 879-891.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, *55(1)*, 68.

Wetzels, M., Odekerken-Schröder, G., & Van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Quarterly, 33(1),* 177-195.

Wu, W. Y., & Sukoco, B. M. (2010). Why should I share? Examining consumers' motives and trust on knowledge sharing. *Journal of Computer Information Systems, 50(4),* 11-19.

Xi, N. N. & Hamar, J. (2019). Does gamification satisfy needs? A study on the relationship between gamification features and intrinsic need satisfaction. *International Journal of Information Management*, 46, 210-221.

Ye, H. J., & Kankanhalli, A. (2017). Solvers' participation in crowdsourcing platforms: Examining the impacts of trust, and benefit and cost factors. The *Journal of Strategic Information Systems, 26(2),* 101-117.