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(Full Paper)

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ABSTRACT

Fairness perceptions have been found to be a critical driving factor for solvers' engagement in crowdsourcing. However, the literature still lacks on how to design crowdsourcing platform to enhance solvers' fairness perceptions. By integrating organizational justice theory with the gamification literature, we conceptualize solvers' perceptions of two typical gamification elements: the point-rewarding perception and the feedback-giving perception. We develop model to explain the effects of gamification perceptions on both distributive and interpersonal justice perceptions, which are conducive to solvers' participation. Based on a survey of 295 solvers, we apply the partial least squares-structural equation modeling (PLS-SEM) approach to test the research model. Results show that both point-rewarding perception and feedback-giving perception can enhance the distributive and interpersonal justice perceptions which, in turn, foster solvers' crowdsourcing participation. Theoretical contributions and practical implications are discussed.

Keywords: Gamification, crowdsourcing, organizational justice theory, distributive justice, interpersonal justice, point-rewarding perception, feedback-giving perception.

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INTRODUCTION

Crowdsourcing platforms are popular online organizations that organize work by sourcing tasks to their members (Ye *et al.*, 2017). According to the World Bank, the crowdsourcing initiatives generated $2 billion revenue globally in 2013 and the number is expected to reach between $15 billion and $25 billion by 2020. Crowdsourcing platforms allow firms to solve problems at a lower cost and retrieve market feedback about new products or services (Boons *et al.*, 2015). However, the ratio of active participation in the crowdsourcing platforms remains extremely low. For instance, only about 6,000 members have visible active profiles in the InnoCentive, suggesting that 98.4% of the registered members are inactive in this platform. A significant reason for the low active participation in the crowdsourcing platform is the lack of sufficient fairness or justice perceived by the solvers, as evidenced in the crowdsourcing contests of Moleskine and Henkel (Faullant *et al.*, 2017). The Moleskine Facebook page ended up with hundreds of negative comments from designers, fans and customers who are disappointed with the Moleskine incentive scheme, which awarded only the winner with a cash prize. In the case of Henkel, participants disagreed with the jury decision and the selected winners of the contest felt overruled.

Anecdotal evidences suggested that in addition to monetary incentives, crowdsourcing solvers also care about fairness; and conflicts may arise due to perceived unfair treatment (Faullant *et al.*, 2017). It has been reported that perceived unfairness in crowdsourcing contests may result from unfair prize allocations, nontransparent jury decisions, unfriendly climate and intolerable communication behavior (Franke *et al.*, 2013; Gebauer *et al.*, 2013). However, crowdsourcing literature reveals little about how to design the crowdsourcing platform to effectively alleviate the perceived unfairness in the crowdsourcing contests.

Gamification elements, such as points, badges, and leaderboard, have been regarded as an effective non-monetary design mechanism in the context of organizational work (Mollick & Rothbard, 2014; Sarangi & Shah, 2015). It has been argued that gamification elements can act as non-monetary rewards that influence people's perceptions of justice, which further alter their behaviors (Abdullah & Wan, 2013). Extrapolating to the context of gamified crowdsourcing, several gamification elements, such as points, badges, and leaderboard, effectively work as non-monetary incentives (Mekler *et al.*, 2017), which might affect solvers' justice perceptions and promote their participation. However, little research has explored the effects of gamification elements on crowdsourcing participation from the justice perspective. Without a nuanced understanding on how the gamification elements influence solvers' justice perceptions and their behaviors, it may be challenging for crowdsourcing platforms to design effective

gamification elements that arouse 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?* By integrating the organizational justice theory with the gamification literature, we develop a research model to explain the impacts of gamification elements perceptions on solvers' crowdsourcing participation. We argue that two gamification elements perceptions, i.e., point-rewarding perception and feedback-giving perception will positively affect both distributive and interpersonal justice perceptions, which in turn affect solvers' crowdsourcing participation. In general, this study will contribute to the crowdsourcing literature by empirically examining the impacts of gamification on solvers' justice perceptions, which affect their participation. It will also extend the gamification literature by integrating organizational justice theory with the gamification literature and exploring the impacts of gamification elements on justice perceptions.

The reminder of this paper is organized as follows. We first introduce the theoretical foundation of this paper, i.e., the gamification literature and the organizational justice theory. Based on the theoretical foundation, we develop our research model and hypotheses correspondingly. Next, we introduce the methodology as well as data analysis results. Finally, we discuss our findings and draw some implications for research and practice.

THEORETICAL BACKGROUND

Organizational Justice Theory

According to the organizational justice theory, justice denotes perceptions of fairness and assessments regarding the appropriateness of performance outcomes or processes (Cropanzano & Greenberg, 1997). Recent theoretical development on organizational justice theory has centered on identifying and distinguishing different dimensions of justice such as distributive justice, procedural justice, interpersonal justice, and informational justice (Greenberg, 1993). Distributive justice focuses on evaluations of the fairness of economic and socio-emotional outcomes that an individual receives, while procedural justice refers to perception of fairness with regard to process and procedure used to make decisions concerning the outcome. The interactional aspect of procedural justice was extracted and conceptualized as interactional justice. Later, Greenberg (1993) further separated the interactional justice into two subcategories: interpersonal justice and informational justice. Interpersonal justice refers to the degree to which individuals are treated by others with politeness, dignity, friendliness, and respect, whereas informational justice reflects the adequacy of explanation behind the process and outcome (Greenberg, 2001).

The organizational justice theory (OJT) primarily posits that users with high justice perceptions will develop trust and satisfaction in uncertain organizational circumstance, which enhance users' reciprocity and loyalty towards the organizations. The OJT has been widely adopted by information systems researchers to analyze the justice perceptions of individuals when adopting the information systems. Some research has been done to investigate online crowdsourcing participation from the perspective of justice. These studies have mainly looked at the effects of perceived justice on solvers' behaviors and outcomes, such as creativity (Franke & Klausberger, 2009; Zou *et al.*, 2015), product interest and perceived product innovativeness (Faullant *et al.*, 2017), and the efforts expended by the solvers (Franke *et al.*, 2013). For example, Zuo *et al.* (2015) suggested that solvers' perceptions of distributive, procedural, and interactional justice positively affect their creative performance, which are mediated by idea cooperation and idea generation. For another instance, Faullant *et al.* (2017) discovered that fairness perceptions of solvers can enhance their product interest, perceived innovativeness, and loyalty intentions. However, relatively little research has stepped further to explore the antecedents for the solvers' justice perceptions. For instance, Fieseler *et al.* (2017) conducted a qualitative survey on 203 active workers in the Amazon Mechanical Turk and proposed some suggestions for increasing their fairness perceptions. They found that minimum remuneration and professionalization can enhance distributive fairness; increased transparency and dispute settlement, and workers' representation both increase procedural justice; while humanization can promote interactional fairness. For another example, Franke *et al.* (2013) based on two experimental simulations to argue that terms and conditions of the crowdsourcing systems and the ex-ante level of identification with the organizing firm affect solvers' perceptions of distributive fairness and procedural fairness which, in turn, influence their willingness to contribute and ex-post identification with the organizing firm. Apart from these few studies, several research has hinted that gamification design elements might impact the fairness perception as well (Callan *et al.*, 2015; Mollick & Rothbard, 2014). In this study, we follow this line of research and explore the driving factors of solvers' fairness perception from the gamification design perspective. We posit that gamification elements might play an effective role in strengthening the justice perceptions of solvers.

Effects of Gamification Elements on Solver Participation

Gamification, referred to the use of game elements in non-game contexts (Deterding *et al.*, 2011), is first introduced to the educational settings as a mechanism to enhance student learning. The notion of gamification is not until recently adopted and developed by information systems scholars to the design of incentive mechanisms for information systems use (Hamari *et al.*, 2016). Gamification in information systems is defined as the adoption of gamified design elements (e.g., points, badge, leaderboard) in information systems in an attempt to, change or improve individual's attitudes and usage behaviors towards the systems (Liu *et al.*, 2017).

Gamification has also been applied to the context of online crowdsourcing, with the aim of enhancing solvers' psychological and behavioral outcomes (Morschheuser *et al.*, 2017). Past research has repeatedly noted that gamification elements foster solvers' engagement and participation by affording their motivations. On one hand, a number of studies have found that gamification elements enhance solvers' participation through their intrinsic motivations. For instance, Blohm & Leimeister (2013) found that offering points in crowdsourcing could enhance participants' sense of flow and immersion, which further motivates them to produce high-quality results. In a similar vein, Goh *et al.* (2017) suggested that awarding points and badges could satisfy the motivational needs for autonomy and competence in mobile crowdsourcing games. Feng *et al.* (2018) based on motivational affordance perspective and discovered that points and feedbacks could motivate solvers to participate in microtask crowdsourcing by fulfilling their intrinsic needs for self-presentation, self-efficacy and playfulness. On the other hand, some studies have also suggested that gamification elements could as well intrigue solvers' extrinsic motivations such as extrinsic need for reputation or recognition, thereby instigating their participation (Blohm & Leimeister, 2013).

Apart from the well-received logic of "gamification-motivation-behavior", prior research has also implied that some gamification elements (e.g., points, badges, leaderboard) might work as effective non-monetary incentives in addition to the monetary rewards in compensating for the solvers' efforts and enhancing their fairness perceptions, which further motivate them to contribute (e.g., Kawajiri *et al.*, 2014; Melenhorst *et al.*, 2015). For instance, solvers with more points are trusted by crowdsourcers as competent service providers (Feng *et al.*, 2018) and possess more chances of winning the bids. Therefore, awarding points is an effective way to reward the solvers' efforts. Apart from that, badges and leaderboard might also play similar roles as points in acknowledging solvers' efforts. Aside from this traditional PBL-triad (i.e., points, badges, leaderboard), feedbacks from the crowdsourcing firms, be it positive or negative, might also work as a useful mechanism to recognize the efforts of the solvers. According to the organizational justice theory, employees will commit to their organizations and conduct organizational citizenship behavior (e.g., working hard) when they perceive that they are treated fairly by their employers (Greenberg, 1993). Therefore, employers can motivate their labors to work harder by offering monetary or non-monetary rewards to recognize their efforts (Greenberg, 1993). Extrapolating to the context of crowdsourcing, the crowdsourcers could make use of the gamification elements (e.g., points and feedbacks) as effective non-monetary incentives to strengthen solvers' justice perceptions, thereby sustaining their participation. However, in both the gamification and crowdsourcing literature, there is scant research trying to link the gamification elements to the justice perceptions and participation behaviors of the solvers.

In the gamified crowdsourcing literature, points, leaderboards, badges/achievements, levels, progress, feedback, and virtual objects are the most frequently mentioned gamification elements (Morschheuser *et al.*, 2017). In the crowdsourcing platform examined in the current study, points and feedbacks are two salient gamification elements, while leaderboards, badges, and virtual objects are not present in this platform. Besides, solver levels overlap with points while progress overlaps with feedbacks in this platform. Hence, in the current study, we specifically focus on points and feedbacks and empirically examine their effects on solvers' justice perceptions and participation behaviors.

Points are typically rewarded for the successful completion of specified activities within the gamified environment, and serve to numerically represent a player's experience and capability (Morschheuser *et al.*, 2017). In the online crowdsourcing platform of this study, points are rewarded when solvers participate and win the tasks. Points are not redeemable for money but could increase the solvers' levels, which is a key criteria when crowdsourcing firms select the winners of the tasks. Hence, points represent a *capability-related non-monetary incentive* that acknowledges the efforts made by the solvers. Gamification elements only work when individuals pay attention to them. Because individuals perceive these elements differently, conceptualising their outcomes as perceptions is critical for the generalisation of our research findings. Hence, we follow the typical practices of past studies, which conceptualize technical elements as user perceptions. We define point-rewarding perception as the solvers' perception of non-monetary incentive mechanism through which the crowdsourcing platform can compensate them for their jobs. Apart from points, verbal feedbacks for solvers' submissions are provided by the crowdsourcing firms regarding the quality of the submissions (Ye & Kankanhalli, 2017). One crowdsourcing task may receive thousands of submissions. When a solver's submission receives feedbacks from the crowdsourcing firm, be it positive or negative, the solver will feel that his efforts has been recognized by the firm, thereby developing a sense of fairness. Hence, feedback giving denotes a *task-related non-monetary incentive* that can enhance the solvers' justice perception. We thus define feedback-giving perception as the solvers' perception of non-monetary incentive mechanism through which the crowdsourcing firms can acknowledge the work of them. Combining the above together, this study conceptualizes two gamification elements perceptions as point rewarding perception and feedback giving perception, and examines their roles as non-monetary incentives to motivate solvers' participation through their justice perceptions.

In terms of the justice perceptions, as illustrated above, procedural justice concerns with the fairness of the processes or procedures of decision-making, while informational justice deals with the adequacy of explanation behind the process and outcome. Therefore, both of these two justice perceptions center on the processes through which decisions/outcomes are made (Greenberg, 2001). In crowdsourcing platforms, points are allocated based on the solvers' performance, while feedbacks are provided as a factual evaluation of the submission quality. These two gamification elements are more related to the outcomes (quality of the submission), rather than the processes leading to the outcomes (evaluation processes by the crowdsourcing firms). In addition, information

regarding the evaluation processes and selection criteria are normally provided a-priori in the task description section, rather than being offered in the feedbacks for each submission. Hence, in this study, when we focus on point rewarding and feedback giving as two gamification elements in the crowdsourcing platforms, we apply only two dimensions of justice, i.e., distributive justice and interpersonal justice to investigate the relationship between gamification elements and solvers' participation.

RESEARCH MODEL AND HYPOTHESES

Drawing on the gamification literature and the organizational justice theory described above, we develop a model to explain solvers' participation in online crowdsourcing platforms as shown in Figure 1. Specifically, we expect that point rewarding perception and feedback giving perception positively affect solvers' perceived distributive justice and interpersonal justice which, in turn, positively affects solvers' crowdsourcing participation.

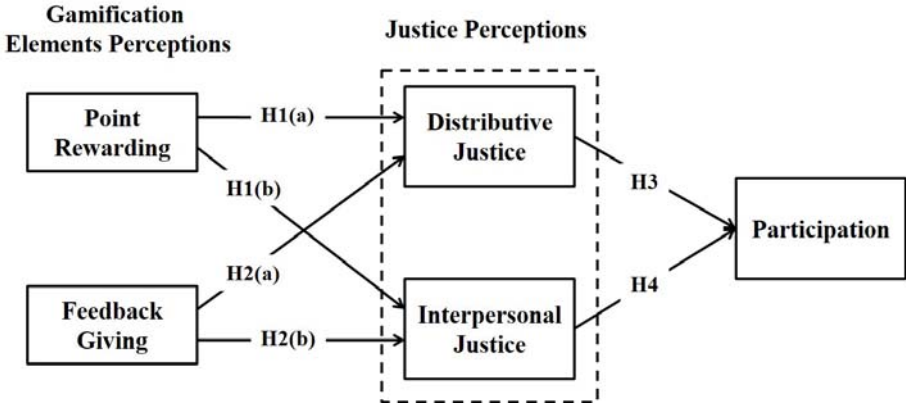

Figure 1: The Research Model

Point Rewarding Perception

Point is one of the most frequently discussed gamification elements in crowdsourcing literature (Morschheuser *et al.*, 2017). The crowdsourcing platform in the current study is equipped with noticeable point rewarding mechanism. As solvers take part in crowdsourcing contests and win the bids, they will receive a certain amount of points as non-monetary incentives apart from the predetermined monetary rewards (Morschheuser *et al.*, 2017). A preponderance of managerial literature (Abdullah & Wan, 2013) indicates that providing non-monetary rewards is an important part of an overall employee compensation plan. In the online crowdsourcing platform, solvers typically devote a great amount of physical/cognitive and emotional efforts to winning the bids. Rewarding solvers with non-monetary incentives such as points indicates that the platform acknowledges the emotional efforts of the solvers. Hence, points provided by the crowdsourcing platform influences the emotional outcome (i.e., a major part of distributive justice) on the solver side. Meanwhile, solvers tend to consider the platform who provides the points to be responsive. This in turn leads to a perception that the crowdsourcing platform treats solvers with respect and politeness, i.e., with interpersonal justice. Therefore, we hypothesize,

H1: Point rewarding perception leads to higher perceptions of (a) distributive justice and (b) interpersonal justice by solvers.

Feedback Giving Perception

Apart from points, another salient gamification element used in the crowdsourcing platform of the current study is feedback giving. After a crowdsourced task is completed and the winning bid(s) is selected, the crowdsourcing firm will be urged to offer clear and reasonable feedbacks/responses to each of the failed submissions, illustrating the reasons why these submissions are not selected. Past research (e.g., Blohm & Leimeister, 2013) has found that solvers have a normative expectation to receive an explanation of the outcome of their failed submissions. The act of providing feedbacks first fulfill solvers' expectation. Second, if the selection criteria of the crowdsourcing firms is rather ambiguous or subjective, the provision of feedbacks can make the final decision at least partly "justifiable". Feedbacks on the quality of the submissions could make the solvers view the final decision as the only feasible or option, which in turn make the final decision of the crowdsourcing firm emotionally acceptable (Morschheuser *et al.*, 2017). Giving feedbacks also demonstrates that a crowdsourcing firm concerns about the failure of individual solvers and puts sufficient effort to compensate the failed solvers. This will generate the perceptions that submissions are treated with respect by the crowdsourcing firm. Therefore, we expect that

H2: Feedback giving perception leads to higher perceptions of (a) distributive justice and (b) interpersonal justice by solvers.

Distributive Justice and Interpersonal Justice

Research on organizational justice has found clear evidence that perceived justice has an impact on individuals' attitudes and behavior. Individuals who perceived themselves as treated unfairly will experience distress, and this distress will motivate efforts to restore fairness within the relationship; failing that, individuals will seek ways to terminate the relationship (Greenberg, 1993). Prior research has mostly agreed that both distributive and interpersonal justice will affect individual behavior In the context of crowdsourcing, there has been a few research showing that solvers' crowdsourcing participation behavior is affected by distributive justice (Franke *et al.*, 2013) and interpersonal justice (Zou *et al.*, 2015). Thus, we expect

H3: Perception of distributive justice is positively related to solvers' crowdsourcing participation.
H4: Perception of interpersonal justice is positively related to solvers' crowdsourcing participation.

We also include gender, age, education level, industry background in our model as control variables that might affect solvers' participation in crowdsourcing tasks.

RESEARCH METHODOLOGY

We collect data from the target population (i.e., solver participants) of a large micro-task crowdsourcing platform through an online survey. All the constructs in our theoretical model are latent variables, which are best studied using the survey approach (Kankanhalli *et al.*, 2015). It is worth noting that the online crowdsourcing platform in this study (i.e., Zhubajie.com) corresponds to the type of competition-based crowdsourcing platform, as most of the tasks in this platform are crowdsourced based on a competitive mode by the crowdsourcing firms. A crowdsourced task may receive thousands of submissions from individual solves, but only one or a handful of qualified submissions will be selected and financially rewarded by the crowdsourcing firms. When one submission is selected and financially rewarded, the solver who provided this submission will receive a certain amount of points. Besides, the crowdsourcing firms can autonomously provide feedbacks to every submission for their crowdsourced tasks. Generally speaking, tasks crowdsourced in this platform fall into the category of "simple task with high outcome variety". Such tasks include logo design, translation, as well as Website design, which require a certain amount of creativity and expertise from the solvers.

Sample

We collected data through invitational private messages sent to registered solvers of the online crowdsourcing platform in this study. The invitational private message included an invitation letter and a link to the survey questionnaire hosted by an online survey platform (www.wenjuan.com) in China. Specifically, we obtained a list of registered solvers from the platform operator and randomly selected 1,000 solvers from the list. Then we sent out the invitational private messages to these solvers. 326 solvers responded by filling out the survey questionnaire, which results in a response rate of 32.6%. After deleting those incomplete responses and repeated responses, a total of 295 questionnaires were employed for data analysis. Table 1 demonstrates the demographic characteristics of the usable samples.

Table 1: Demographics Information

Measure	Item	Frequency	Percentage (%)
Gender	Male	169	57.3
	Female	126	42.7
Age	< 18	1	0.3
	18-24	96	32.5
	25-35	180	61.0
	36-50	17	5.8
	>50	1	0.3
Education level	High school and below	19	6.4
	College (Diploma)	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 available, the constructs in the conceptual model were operationalized using existing instruments adapted from past studies to enhance validity. Otherwise, new instruments were developed based on its definition, interviews with subjects and a review of previous gamification and crowdsourcing literature. Please find the items in Table 2.

Table 2: Operationalization of Constructs

Constructs		Items	Source
Point Rewarding Perception (PNT)	PNT1	This platform increases my points according to my behaviors (e.g., submission, winning the bids)	Adapted from (Feng *et al.*, 2018)
	PNT2	This platform precisely evaluates my behaviors and increase my points	
	PNT3	Points is a critical measurement for the competence of solvers in this platform	
Feedback Giving Perception (FEB)	FEB1	This platform allows the crowdsourcing firms to express thanks to my submissions	Adapted from (Feng *et al.*, 2018)
	FEB2	This platform allows the crowdsourcing firms to comment on my submissions	
	FEB3	This platform allows the crowdsourcing firms to evaluate the quality of my submission (i.e., good, normal, or bad)	
Distributive Justice (DIS)	DIS1	What I obtain from this platform is fair compared to the efforts I have made	Adapted from (Skarlicki & Folger, 1997; Zou *et al.*, 2015)
	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	
Solver Participation (PAR)	PAR1	I plan to actively participate in the tasks of this platform	Adapted from (Wu & Sukoco, 2010)
	PAR2	I plan to actively participate in the tasks of this platform in the future	
	PAR3	I will try my best to engage 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	

Notes: All items are based on 5-point Likert scale (1 = strongly disagree to 5 = strongly agree)

To enhance the validity of the newly developed instruments (i.e., instruments for point rewarding and feedback giving), we conducted exploratory interviews with eight crowdsourcing solvers to identify what gamification features they recognized and perceived when using this platform. We also conducted a pilot test with 40 individuals to validate the new instruments. Following the procedures introduced by past research, items for all constructs are tested with a two-stage Q-sorting process to enhance their content validity, convergent validity as well as discriminant validity. All instruments were measured using five-point Likert-scales anchored from "strongly disagree" to "strongly agree" (See Table 2 for the instruments). Items from English were translated into Chinese and given to six information systems professors who were proficient in both languages for reverse translation. We then carefully considered all controversial translations.

RESULTS

Partial least squares (PLS) was adopted to analyze the survey data. PLS-SEM instead of co-variance based SEM is suitable for analyzing the model with formative constructs (Wetzels *et al.*, 2009). Following Wetzels *et al.* (2009), bootstrapping was

performed to test the statistical significance of path coefficients. In the model tested, all constructs were modeled as reflective. SmartPLS 2.0 was used for data analysis.

The Measurement Model

Convergent validity is assessed by (1) reliability of items, (2) composite reliability of constructs (>0.7), (3) average variance extracted (AVE) (>0.5) , and (4) factor analysis results. Examining each item's loading on its corresponding construct assesses reliability of items (Standardized Factor Loading > 0.7). In this study, the loading of each item meets this criterion (Table 3). Regarding internal consistency (reliability), composite reliability scores and Cronbach's alpha scores for every construct (as shown in Table 4) are well above 0.70, which is the suggested benchmark for acceptable reliability. AVE measures the amount of variance that a construct captures from its indicators relative to the amount due to measurement error. It is recommended to exceed 0.50. Table 4 shows that the AVE score for every construct, ranging from 0.73 to 0.77, satisfies this requirement. In addition, to show good convergent validity in factor analysis results, all of the items should load highly on their own latent variables. Factor analysis results in this study (see Table 3) are satisfactory according to these criteria.

Table 3: Exploratory Factor Analysis Results

	1	2	3	4	5
PAR1	**0.85**	0.15	0.17	0.13	0.12
PAR2	**0.83**	0.14	0.12	0.10	0.16
PAR3	**0.81**	0.10	0.22	0.17	0.06
PAR4	**0.83**	0.15	0.06	0.11	0.24
DIS1	0.15	**0.82**	0.23	0.12	0.12
DIS2	0.15	**0.80**	0.24	0.08	0.18
DIS3	0.12	**0.83**	0.22	0.15	0.11
DIS4	0.15	**0.77**	0.26	0.15	0.09
INT1	0.20	0.22	**0.73**	0.19	0.24
INT2	0.17	0.24	**0.76**	0.19	0.16
INT3	0.13	0.26	**0.82**	0.09	0.12
INT4	0.13	0.31	**0.75**	0.13	0.20
PNT1	0.18	0.16	0.18	0.24	**0.77**
PNT2	0.15	0.10	0.23	0.23	**0.81**
PNT3	0.20	0.19	0.18	0.18	**0.80**
FEB1	0.17	0.14	0.15	**0.80**	0.24
FEB2	0.13	0.14	0.14	**0.84**	0.22
FEB3	0.17	0.14	0.17	**0.79**	0.14
Eigenvalue	7.72	2.04	1.68	1.17	1.04
% of variance	42.88	11.31	9.35	6.50	5.78
Cumulative%	42.88	54.19	63.54	70.03	75.80

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

Variable	Mean	SD	CA	CR	AVE	PAR	DIS	INT	PNT	FEB
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		
PNT	3.94	0.68	0.85	0.91	0.77	0.44	0.42	0.52	0.88	
FEB	4.06	0.76	0.84	0.90	0.76	0.39	0.39	0.45	0.54	0.87
Notes: Diagonal elements are the square root of the average variance extracted (AVE)										
SD, standard deviation; CA, Cronbach's alpha; CR, composite reliability										

Discriminant validity is assessed by examining the indicator-construct loadings and inter-construct correlations. As shown in Table 3, all indicators load more strongly on their corresponding constructs than on other constructs in the model. Table 4 shows the square roots of the average variance extracted (AVE) are larger than the inter-construct correlations. Overall, the constructs demonstrate strong discriminant validity.

Finally, we assessed the extent of common method variance (CMV) using the marker-variable technique. The marker variable utilized was fantasizing, which is theoretically unrelated and we examined correlations between the marker variable and other constructs. Fantasizing had been used as marker variable in several prior studies (e.g., Ye & Kankanhalli, 2017; Feng *et al.*, 2018)

and showed good validity in detecting CMV. The smallest correlation with fantasizing was -0.03 ($p>0.05$), indicating that CMV was not substantial in our study.

Hypothesis Testing

Hypothesis testing results are shown in Figure 2 and Table 5. Demographic variables (i.e., gender, age, 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, indicating that female are more willing to participate in crowdsourcing than male.

Consistent with our prediction, point rewarding exhibits a positive influence on distributive justice ($\beta=0.29$, $p<0.001$), hence supporting H1(a). Point rewarding also shows positive influence on interpersonal justice ($\beta=0.39$, $p<0.001$), supporting H1(b). Consistent with our prediction, feedback giving is positively related to distributive justice ($\beta=0.24$, $p<0.001$), supporting H2(a). The relationship between feedback giving and interpersonal justice is also significant ($\beta=0.24$, $p<0.001$),supporting H2(b). Moreover, as anticipated, both distributive justice ($\beta=0.21$, $p<0.001$) and interpersonal justice ($\beta=0.30$, $p<0.001$) exhibit positive relationship with solvers' participation, supporting both H3 and H4. Table 5 summarizes the results of the hypothesis tests.

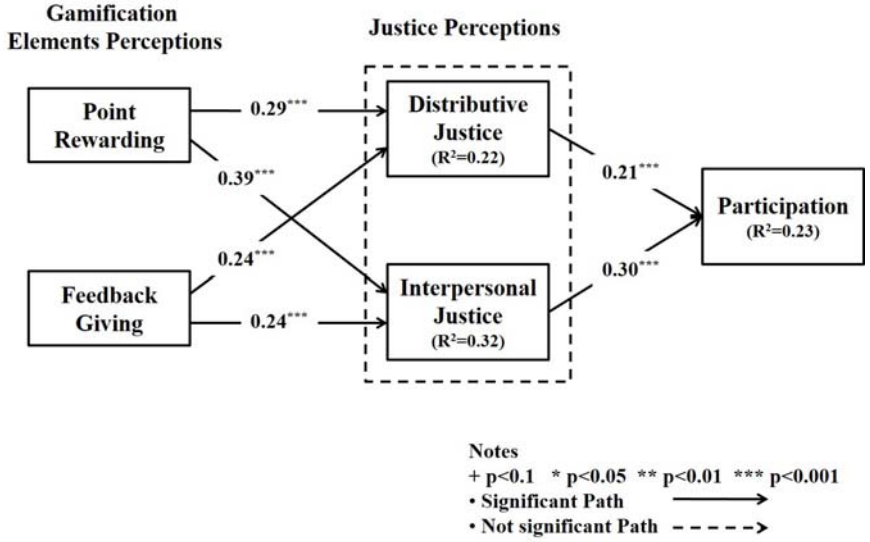

Figure 2: Hypothesis Testing Result

Table 5: Tests of Research Hypotheses

Proposed paths				Path estimates	*p*-levels	S.E.	Hypothesis tests
H1(a)	PNT	→	DIS	0.29	<0.001	0.07	**Supported**
H1(b)	PNT	→	INT	0.39	<0.001	0.06	**Supported**
H2(a)	FEB	→	DIS	0.24	<0.001	0.07	**Supported**
H2(b)	FEB	→	INT	0.24	<0.001	0.06	**Supported**
H3	DIS	→	PAR	0.21	<0.001	0.06	**Supported**
H4	INT	→	PAR	0.30	<0.001	0.07	**Supported**

DISCUSSION

Nowadays, individuals and organizations increasingly count on online crowdsourcing platforms for effective solutions and creative ideas (Ye & Kankanhalli, 2017). Motivating solvers to perform is the key to the sustainability of these online crowdsourcing platforms (Ye & Kankanhalli, 2017). How to encourage solvers to participate in solving crowdsourced tasks is always an important topic for researchers and practitioners. Considering this, we seek to enrich the understanding of solvers' participation in the crowdsourcing platforms. Empirical results support our hypotheses that the perceptions of two typical gamification elements (i.e., point rewarding and feedback giving) positively affect solvers' distributive and interpersonal justice perceptions. These two distinct types of justice perception, in turn, positively influence solvers' participation. Taken together, results of this study suggest that gamification elements indirectly influence solvers' participation in crowdsourcing platforms through both the distributive and interpersonal justice perceptions.

Theoretical Contributions

This study makes several important theoretical contributions. First, we enrich the literature on gamified crowdsourcing (Goh *et al.*, 2017) by theoretically conceptualizing gamification elements into point rewarding perception and feedback giving perception, and

theorizing and testing their impacts on solvers' justice perceptions and participation. This paves a way for future study on the impacts of gamification artifacts.

Second, past empirical literature on gamification has been limited to studying the impacts of gamification elements on solvers' 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' justice perceptions. This study extends previous gamification literature by theorizing and empirically validating the impacts of gamification element perceptions on solvers' justice perceptions in the crowdsourcing platforms. Results suggest that in crowdsourcing platforms, point rewarding and feedback giving artifacts can affect both distributive and interpersonal justice perceptions of the solvers.

Third, prior crowdsourcing research has been mainly limited to studying the impacts of different justice perceptions on solvers' participation (Zou *et al.*, 2015; Faullant *et al.*, 2017). This study enriches previous crowdsourcing studies (Franke *et al.*, 2013) by stepping further to explore and examine platform designs as antecedents for justice perceptions. Specifically, we conceptualize point rewarding and feedback giving as two typical gamification elements perceptions and bridge them with the distributive and interpersonal justice perceptions of the solvers. This extends our knowledge on how the crowdsourcing platforms can be designed to compensate the solvers and motivate them to participate.

Fourth, this study contributes to the literature on organizational justice theory. We link organizational justice theory with gamification literature to theorize on the impacts of gamification artifacts. As a result, we identify two gamification artifacts as the critical sources for solvers' distributive and interpersonal justice perceptions. This adds to the development of organizational justice theory.

Practical Implications

From a pragmatic view, we provide insights to firms and crowdsourcing platform operators on how to encourage solvers to participate in crowdsourcing. Specifically, this study contributes to practice in three ways. First, it provides suggestions for encouraging solvers to participate in crowdsourcing through designing an effective point rewarding mechanism. On one hand, results suggest that a well-designed points system could promote solvers' participation in crowdsourcing by enhancing 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, results 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, an effective feedback mechanism is also important. Crowdsourcing platforms could attempt to reinforce solvers' distributive and interpersonal justice perceptions by soliciting the crowdsourcing firms to offer prompt and constructive feedbacks for the submissions. Specifically, crowdsourcing platforms should encourage the firms to reply to as many as the submissions immediately after the task is completed. To achieve that, crowdsourcing platforms should design a function to remind the firms to select bids and provide 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 and interpersonal justice which, in turn, enhance their crowdsourcing participation.

Limitations and Future Directions

We acknowledge some limitations in this study. First, different from prior research that typically adopted an experimental method to study the effects of gamification artifacts, we examine the effects of gamification artifacts through a cross-sectional survey, which has its own merits. Although the experimental method might be better in inferring 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 two main dimensions of justice (distributive and interpersonal justice). Organizational justice literature suggests that there are other two dimensions of justice (i.e., procedural and informational justice). We refrained from including these two dimensions in our model because we suspected 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 feedbacks, which could influence the procedural and information justice perceptions as well. Future research should also account for this possible link.

This study opens up a number of exciting avenues for further research. This study shows the influences of two typical gamification artifacts on solvers' justice perceptions and participation. Yet, there is a range of gamification artifacts of which the effecting paths remain unknown. We encourage researchers to identify other gamification artifacts (e.g., badges, leaderboard) that may be important and to examine how such artifacts affect solvers' justice perceptions and participation in online crowdsourcing platforms.

CONCLUSIONS

Despite various measures taken, solvers' participation continues to be inadequate in online crowdsourcing platforms. Given the importance of solvers' participation, practitioners have expressed substantial concerns on encouraging such behaviors. To this end, we provide a theory-driven approach to evaluate the importance of gamification artifacts in helping practitioners to enhance the sustainability of crowdsourcing platforms via distributive and interpersonal justice perceptions. Our findings clearly indicate that the integration of gamification literature and organizational justice theory is essential for a better understanding of solvers' participation in the gamified crowdsourcing platforms. We believe that the model proposed in this study can serve as a solid foundation for future work in this important area.

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