Do Achievement Goals and Work Nature Affect Contributor Performance in Gamified Crowdsourcing? An Exploratory Study in an Academic Setting

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Abstract. Many studies have demonstrated the benefits of gamification in the context of crowdsourcing. However, not every user benefits equally from gamification. Most of the current studies focused on the game elements of gamified systems. Scant attention has been paid to the factors related to the users (Koivisto and Hamari 2014; Morschheuser et al. 2016). University students will be recruited to trial a gamified crowdsourcing system for two weeks. Our study aims to explore whether achievement goal orientations influence user performance in gamified crowdsourcing systems. In addition, certain types of crowdsourcing require creativity, whereas tasks of other types of crowdsourcing can be done mechanically. The achievement goals may also affect user performance in different tasks. Our study explores whether users' achievement goals affect their performance in homogeneous and heterogeneous tasks respectively in the context of gamified crowdsourcing. Results of our study will contribute to the expanding literature on whether gamification works on all people. The results will also help us understand more about the behavior of users with different achievement goals in gamified crowdsourcing systems.

Keywords: Crowdsourcing · Gamification · Achievement goals · Creativity · Brainstorming

1 Introduction

Crowdsourcing harnesses the intelligence and efforts of the crowd. Crowdsourcing systems exist in various forms. For example, organizations can outsource trivial tasks to the crowd through crowdsourcing systems like Amazon Mechanical Turk. Learners can post questions, answer enquiries and rate answers on crowdsourcing websites such as Stack Overflow and ResearchGate. Travelers can also rate hotels and tourist spots on crowdsourcing platforms, e.g. TripAdvisor. The underlying principle of crowdsourcing is that contributors can follow their own preferences and choose their own tasks freely (Geiger and Schader 2014).

Crowdsourcing applications can be generally classified into four types, including crowd solving, crowd creation, crowd processing and crowd rating (Geiger et al. 2012). They differentiate from each other in two dimensions, i.e. values derived from contributions and values differentiated among contributions (see Fig. 1). Contributions of crowd processing and crowd rating are valued equally. Each of the contribution leads to identical or similar rewards. The tasks of crowd processing and crowd rating are usually rather homogeneous. On the other hand, values of each contribution in crowd solving and crowd creation are not the same. Tasks of crowd solving and crowd creation are heterogeneous. They usually demand certain extents of contributors' creativity and innovation. Contributors who provide quality work receive better rewards.
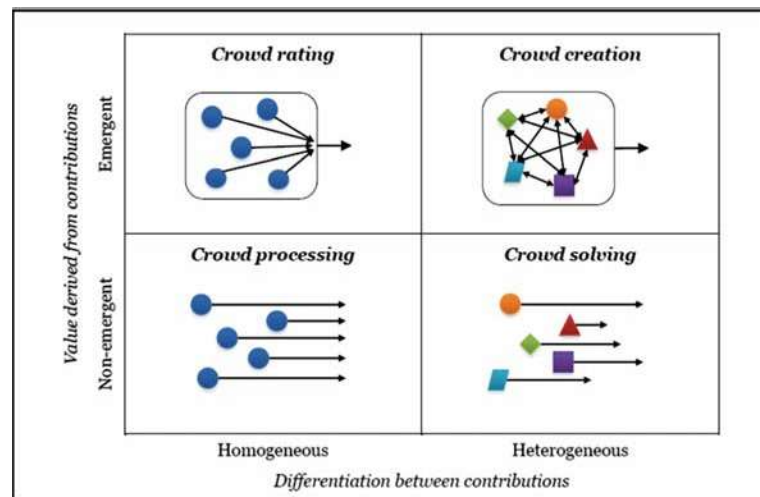

Fig. 1. Four types of crowdsourcing information systems (Adapted from Geiger et al. (2012)).

Values derived from contributions can be classified as emergent and non-emergent. Crowd rating and crowd creation are considered as emergent crowdsourcing systems where fusion of contributions constitutes a better output. Crowd processing and crowd solving are non-emergent. Integration of their contributions brings no extra values.

The contributors of most crowdsourcing systems are volunteers. Thus, how to motivate the contributors is an important question for system designers as well as researchers. Gamification has recently been adopted with the aim of motivating users of crowdsourcing systems.

Various studies have demonstrated the benefits of gamification in the context of crowdsourcing. Some examples include an increase of engagement (Itoko et al. 2014; Vasilescu et al. 2014) and an improvement in work quality (Eickhoff et al. 2012; Goncalves et al. 2014). However, most of the studies attended to game elements of systems. Scant attention was paid to the factors related to the users (Koivisto and Hamari 2014; Morschheuser et al. 2016). According to Morschheuser et al. (2016)'s review paper, only one paper explored the difference in behaviors between different user groups: Itoko et al. (2014) investigated the effectiveness of game affordances for

young and old users in a gamified proofreading system. Our study sheds light on the difference in effectiveness of gamification for people with different achievement goals.

Furthermore, different types of crowdsourcing require different competence. Whereas crowd processing and crowd rating tasks can be completed rather mechanically, crowd solving and crowd creating tasks require contributors' creativity. Performance in different types of tasks should be evaluated respectively.

An exploratory study will be conducted among university students who are enrolled in the same course. They will trial a gamified crowdsourcing system for two weeks as an exercise of the course. Their achievement goals (Elliot and McGregor 2001) and creative self-efficacy (Tierney and Farmer 2002) will be measured before the trial, and their performance in both homogeneous and heterogeneous tasks over the two-week duration will be recorded. The study aims to explore whether achievement goal orientations influence user performance in gamified crowdsourcing applications. We propose that a point system and a leaderboard, two common motivational affordances in games, create an environment through which users can compare themselves with others and gain senses of achievement. The users with a stronger performance-approach goal will perform better, since they are more easily influenced by the positive senses of achievement gained from social comparison. On the other hand, the users with a strong mastery-avoidance goal tend to avoid making mistakes. We propose that this behavior may limit their performance in heterogeneous tasks. Results of our study will contribute to the expanding literature on whether gamification works on all people. The results will help us understand more about the behavior of users with different achievement goals in gamified crowdsourcing systems.

2 Literature Review

2.1 Gamification

Gamification is defined as using the game elements in non-game contexts (Deterding et al. 2011). Gamification has been applied in different areas such as commerce, education and health (For a detailed review, see Hamari et al. (2014)). The most commonly implemented features of gamification in crowdsourcing context were point systems and leaderboards (Morschheuser et al. 2016). These two motivational affordances help create a gaming environment and facilitate competition among participants.

2.2 Individual Difference Towards Gamification

Not everyone perceives and benefits equally from gamification. A number of researchers have shown that users' attitudes towards gamified systems differ. Montola et al. (2009) interviewed contributors of a photo sharing mobile application, and identified three different types of attitudes. They categorized the contributors as indifferent users, confused users and appreciative users. Eickhoff et al. (2012) suggested that contributors can be classified as either entertainment-motivated or money-motivated. Gamified crowdsourcing systems should be customized for contributors with different motivations. Hamari (2013) found that earning badges did not

significantly affect all users' behaviors in a peer-to-peer trading service system. Only users who kept an eye on their own badges and compared them against other users were positively influenced by the badges. Koivisto and Hamari (2014) discovered that female users perceived a gamified exercise-tracking system more playful than men did. The female benefited more from the system in social influence, reciprocal benefits and recognition.

2.3 Achievement Goal

An achievement goal is defined as "an integrated pattern of beliefs, attributions, and affect that produces the intentions of behavior" (Ames 1992, p. 261). It is concerned with the underlying aims of achievement behavior. There are two major kinds of achievement goals of students, namely mastery goals and performance goals. These goals represent different concepts of success and approaches adopted to reach the success (Ames 1992). The mastery goal is concerned with people improving their abilities and mastering new skills. On the other hand, the performance goal focuses on that individuals gain a sense of achievement through comparison among their counterparts (Dweck 1986).

More recent papers incorporated the concepts of approach-avoidance motivation into the previous two achievement goals (Elliot and McGregor 2001). Approach motivation features active acquisition of positive outcomes, whereas avoidance motivation highlights avoidance of negative possibilities. Thus, this framework outlined four achievement motivations, namely mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance. People differ in their achievement motivations.

2.4 Creativity

Creativity plays an important role in the context of crowdsourcing. Particularly, it is required by tasks of crowd creation and crowd solving. Individual creativity can be indirectly measured by creative self-efficacy, given that people who are more creative possess stronger creative self-efficacy (Tierney and Farmer 2002). Several studies revealed possible linkages between creativity and achievement goals. Gong et al. (2009) empirically showed that creativity and job performance were positively correlated. They also suggested that mastery-approach goal enhanced creativity over time. Hirst et al. (2009) suggested that team learning behavior was a moderator of the relationship between a mastery-approach goal and creativity. Huang and Luthans (2015) indicated an indirect effect of learning goals on creativity when people think and behave independently. These studies show a strong relationship between achievements goals and creative self-efficacy in various environments. These studies reveal possible effects of achievement goals to performance in heterogeneous tasks in gamified settings.

3   Hypothesis Development

Gamification incorporates game affordances into a non-game context. The gaming environmental cue of a gamified system may serve as a stimulus of achievement to users. If the users possess a strong achievement goal, the cognitive link between achievement stimuli and the achievement goal is closer (Bargh 1990; McClelland et al. 1953). In the presence of the achievement stimuli, the users will spend more efforts on the tasks in a reflexive manner (Bargh et al. 2001; Shah 2003).

Point systems and leaderboards cultivate a competing environment where users can interact and compare with other users. The motivational affordances render a larger exposure of the users to competition. They also help promote positive judgments among users. Thus, the competition forms an achievement stimulus that is more associated with the performance-approach goal, since the performance-approach goal features positive possibilities of social comparison with counterparts. Also, given that the different nature of homogeneous and heterogeneous tasks may affect user performance. Performance in these tasks should be considered respectively. We therefore hypothesize that:

H1a: If users have a stronger performance-approach goal, then they will perform better in heterogeneous tasks in a gamified crowdsourcing environment.

H1b: If users have a stronger performance-approach goal, then they will perform better in homogeneous tasks in a gamified crowdsourcing environment.

On the other hand, these motivational affordances may bring less advantage to people with a strong mastery goal, since these people place more emphasis on personal development. Furthermore, people with a strong mastery-avoidance goal tend to prevent themselves from negative judgment of their abilities. They aim at making no mistakes. This behavior may limit their performance in creativity work, given that criteria for correct answers in heterogeneous work is less objective and explicit. Such behavior, however, may not influence their performance in homogenous tasks. Hence, we hypothesize that:

H2a: If users have a stronger mastery-avoidance goal, then they will perform worse in heterogeneous tasks in a gamified crowdsourcing environment.

H2b. Even if users have a stronger mastery-avoidance goal, they will not necessarily perform worse in homogeneous tasks in a gamified crowdsourcing environment.

4   Methods and Data Analysis

4.1   The Gamified Crowdsourcing System

A gamified crowdsourcing system developed by an IT company in Hong Kong will be used in our exploratory study. Two motivational affordances – a point system and a leaderboard – are implemented in the system. Users can choose to work on any outstanding tasks (see Fig. 2). Heterogeneous tasks refer to solutions to the brainstorming tasks in the system. These brainstorming tasks are concerned with daily conversation in different business contexts. Questions in the tasks are designed in a way that little specialized knowledge is required to complete them. The questions are comparable to

Malaga (2000)'s question for brainstorming sessions: "Produce a list of as many new delicious ice cream flavors as possible" (p. 132). The answers will be reviewed by other users (see Fig. 3). Answers that are reviewed and endorsed by more than 3 users are considered as correct answers. The review tasks are considered as homogeneous tasks. The users receive points for correct answers, and additional points will be given for unseen answers detected by the system. In addition, not every task has the same rewards. Some more challenging tasks offer more points to contributors.

The system has not been publicly launched, so the system is new to all users. The outstanding tasks in the system are brainstorming and review assignments that are related to daily conversation in different business application domains.
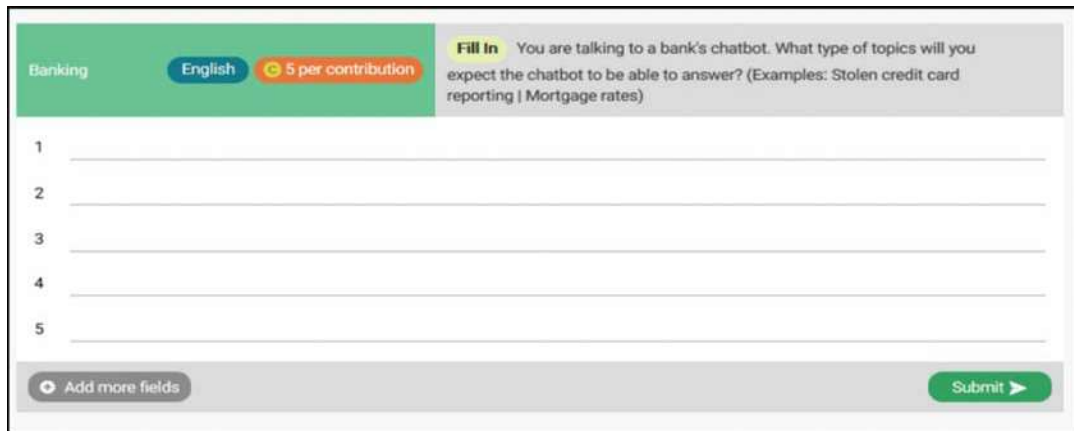

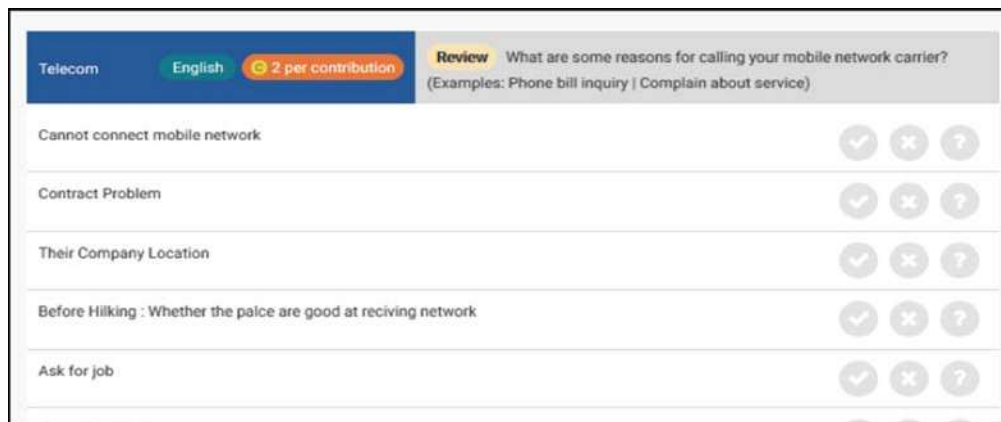**Fig. 2.** An example of a brainstorming task in the gamified crowdsourcing system.

Fig. 3. An example of a review task in the gamified crowdsourcing system.

4.2 Data Collection and Analysis

Undergraduate students enrolled in a computer science course will be recruited to participant the study as an exercise to understand system design of crowdsourcing systems. They will trial the gamified crowdsourcing system for two weeks. They will

be told that the crowdsourcing work in the system will be used to support a chatbot development project. Before the trial, they will fill in online questionnaires which measure their achievement goals and creative self-efficacy. Questions of achievement goals are adopted from Elliot and McGregor (2001), whereas questions of creative self-efficacy are adopted from Tierney and Farmer (2002). The scores of brainstorming tasks and review tasks are recorded respectively. These scores are dependent variables.

To test the hypotheses, we follow Elliot and McGregor (2001) to conduct a simultaneous multiple regression analysis to predict each score from the four achievement goal orientations. The creative self-efficacy will be controlled in each analysis.

4.3 Limitations

The study involves some limitations. First, the participants are enrolled in a particular course. The variety of population may be limited. Also, it is unclear whether the two-week trial is long enough. Furthermore, our study measures achievement goals for learning. The choice of measurement is considered to be appropriate, given that the trial of the system is an exercise of the course. The measurement, however, should be adapted for study in other fields.

5 Ongoing Work

Participants with strong performance-approach goals are expected to perform better in all tasks. This will indicate that people with a stronger performance-approach goal benefit more from a gamified setting. Participants with a strong mastery-avoidance goal are expected to perform worse in brainstorming tasks. These possible results will demonstrate that gamification does not work well on all people. Also, contributor performance differs in different tasks. System designers and researchers should place more emphasis on factors related to users in future studies.

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