Internal Incentive Mechanisms for Crowdsourced Participants in Creative Design Tasks

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Abstract

Growth in crowdsourced web platforms has produced a wide variety of opportunities for matching skills with employers. Participants in crowdsourcing systems are experiencing an increasing degree of choice and control over the tasks available to them. If requesters can correctly determine a participant's internal incentive mechanism, they will be more able to configure and assign tasks. Correctly configured and assigned tasks will result in improved outcomes from crowdsourced creative design projects.

This paper presents the results of a survey concerning crowdsource participant opinions on internal incentive mechanisms during the completion of creative design tasks. A survey was issued and consisted of four primary dimensions of internal motivation: entertainment, personal development, humanitarian, and status. Pearson's Correlation coefficient and linear regressions were used to analyze the data and it was found that entertainment, was the most important dimension for participants to experience a feeling of reward. Gamification and fun appeared to be driving the primary incentive effect within the entertainment dimension.

Keywords: Crowdsourcing, Creative design tasks, Internal incentive mechanisms

1. INTRODUCTION

Crowdsourcing is a modern method of realizing human intelligence through task outsourcing and network distribution effects. It provides unprecedented opportunities for people to share their observations and knowledge with other people around the world, and can be used to target specific functions (Howe, 2006);(Brabham, 2008);(Estellés-Arolas & González-Ladrón-de-Guevara, 2012).

Crowdsourcing gathers talent to take advantage of originality, collaborative intelligence, reduced costs and lowered processing times. It has already been used in a multitude of ways and has unlocked opportunities for development in fields such as image classification, video tagging and other tasks that computers still struggle with (Krizhevsky et al., 2012).

Previous research on crowdsourcing has focused on specific aspects such as incentive engineering (Muldoon et al., 2018), privacy protection (Alkharashi & Renauld, 2018), data analysis (Li et al., 2016), and statistical analysis (Tarrell et al., 2013)(Aris, 2017).

In the 21st century, one key example of crowdsourcing is Wikipedia, a project which was started in 2003. Wikipedia's online user edited encyclopedia is one of the leading examples of leveraging collective knowledge and experience. Similarly, the online video website YouTube began operation in 2005, and is now a prime example of crowdsourced entertainment. Nassar and Karray described the crowdsourcing process in detail, delineating the following modules: reward, quality control method, collection, verification, summary and subject matter, and expert discovery (Nassar & Karray, 2019). Crowdsourcing is able to provide innovative solutions while also developing personal and social relationships for its users (Shaw, Horton, & Chen, 2011).

Interactions that occur when users collaborate leads to the development of certain behavioral patterns. For example, submitting creative design requests to crowdsourced platforms has become a new design trend (Amato, Sappa, Fornés, Lumbreras, & Lladós, 2013; Peng, Babar, & Ebert, 2014). Many modern websites have accumulated experience in generating effective incentive mechanisms that encourage and promote crowdsourced development (Chittilappilly, Chen, & Amer-Yahia, 2016). However, the particular ways in which they trigger the key incentive mechanisms to generate their success are still unclear. New reward mechanisms that trigger intrinsic motivation are the core of user involvement and retention.

The results of this study contribute to the existing literature on incentive mechanisms in creative design tasks. Understanding the design process and its incentive system enables creators to be more successful when developing online design marketing operations through a crowdsourcing approach. Development of a successful model provides users with a set of creative design tasks and a business strategy to follow. This research follows the creative design task process and provide and the analysis follows that of existing literature on internal incentive mechanisms.

2. Literature review

Market oriented brands and discussion of their approaches are typically focused on specific brand websites, such as Threadless；or social networking sites such as Facebook, or Twitter；customer review sites such as Amazon, Epinions；or streaming media sites such as YouTube. (Alt, Shirazi, Schmidt, Kramer, & Nawaz, 2010). Market-orientation discussions are no longer limited to computing, coordination, and conventional business-driven communications, they now involve an understanding of how to create and propagate multimedia maketing messages (Berthon, Holbrook, Hulbert, and Pitt, 2007).

One example of a crowdsourced design company is the Threadless T-shirt company in Chicago, USA. Members of the company's community submit their new T-shirt designs, and approximately 1,500 amateur and professional designs are submitted every week. Customers are able to directly create a design, and then put their idea on the website for other users to rate. Each member of the website votes on the designs, and the winning design is printed and paid for by customers, so that people all over the world become an indirect customer of the user's product. Top scoring t-shirts enter another contest for a place on the mass production candidate list. Actual mass production depends on whether there are enough pre-orders received. Once a selection of winning designs have been selected, the designs are shortlisted to provide a top three. Designers earn a score, a medal, and a $2,000 USD bonus. The designer's name is also be printed on each

T-shirt, and the work is sold through the online store. If the design is reprinted by customers, the designer receives an additional $500 USD reward. This reward mechanism increases consumer participation and satisfaction Threadless keeps costs down by not hiring full-time designers, and also by only producing the correct number of garments (Brabham, 2010).

Production by this method means that production volume can be accurately determined before production begins. In the case of Threadless, a majority of the business overheads are in website maintenance and maintaining up-time. This positions the business favorably, with light to negative running costs, and a very low risk regarding stored product (Allahbakhsh et al., 2013). The customer community has in-effect undertaken core functions of the business such as innovation, new product development, sales forecasting and marketing (Kohler, 2015). The customer base is also increasingly responsible for marketing and sales. This is an extreme example of outsourcing as a key component of the business model (Jones & Jones, 2013), where previously there would have been heavy reliance on the trinity of contractors, intermediaries and subcontractors (Füller, Hutter, & Faullant, 2011).

2.1 Crowdsourcing

In the 2006 edition of WIRED magazine "The Rise of Crowdsourcing", the editor Jeff Howe described the concept of crowdsourcing as "a new business model in which companies use the Internet to distribute work, discover ideas or solve technical problems" (Howe, 2006). Crowdsourcing now refers to a specific composite fusion of three defined elements: Crowds, Outsourcing, and Social webs (Saxton, 2013). Crowdsourcing is an online, distributed, problem-solving model that is free to participate in and entirely voluntary (Brabham, 2008, 2013). It enables individuals, companies or organizations to leverage distributed human intelligence, knowledge, skills, and work experience to complete defined tasks across public networks (Hossain & Kauranen, 2015; Mihalcea & Chklovski, 2004; Weld et al., 2008).

2.2 Crowdsourcing Systems

The general system flow of a crowdsourcing application contains four elements and these are described by (Doan, Ramakrishnan, & Halevy, 2011; Ghezzi, Gabelloni, Martini, & Natalicchio, 2018) as:

(1)   Tasks: define a group of outsourceable objects with specific characteristics, where task design and reward schemes are important (Gill & Hicks, 2006; Nevo, Kotlarsky, & Nevo, 2012; Zheng, Li, & Hou, 2011).

(2)   Requesters: also known as crowdsourcers, publishers or seekers, publish tasks that require a solution; in this regard, 'project executors' can be an individual, company, or profit/non-profit organization. Executors release, or assign the tasks that require solutions (Kadadha, Otrok, Mizouni, Singh, & Ouali, 2020).

(3)   Participants: workers, solvers, participants, or providers are the group that possesses the required knowledge, skills, or abilities to complete the work. Participants can be individuals or small groups (Füller, Mühlbacher, Matzler, & Jawecki, 2009; Zheng et al., 2011).

(4)   Platforms: act as a medium and intermediary between the requester and participant. They must provide effective tools and measures to ensure the project is successful (Blohm, Zogaj, Bretschneider, & Leimeister, 2018; Howcroft & Bergvall-Kåreborn, 2019; Nakatsu, Grossman, & Iacovou, 2014).

They must organize and manage the crowdsourcing process, and should be able to carry out transactions on behalf of the requester. A requester creates tasks with details and forwards tasks to the platform. Once tasks are published on the platform, workers search through the outstanding tasks and may also assign jobs to oher suitable workers. Workers execute tasks and submit solutions to the requester through the platform. The platform forwards these solutions to the requester for validation. Finally, workers are rewarded through the platform, after the requester has verified the submitted solutions (Chiu, Liang, & Turban, 2014; Howcroft & Bergvall-Kåreborn, 2019).

2.3 Crowdsourcing frameworks

The crowdsourcing development process involves pre-defined steps on the way to project completion (Tarrell et al, 2013; Chittilappilly et al, 2016; Liu & Lu, 2016;Silva et al, 2017;Ghezzi et al , 2017). However, as the number of crowdsourcing platforms and applications increase, so do the number of processes involved (Doan et al., 2011). Most frameworks can be categorized as having three steps, (i) initialization, (ii) implementation, (iii) completion (Byström & Järvelin, 1995; Vakkari, 1999).

(i) Initialization, involves task preparation (Campbell, 1988). The requester designs the task and propagates the request across the platform to an appropriate demographic (Bruns, 2007). This initialization process includes the task design, task setting and any incentive measures (Gill & Hicks, 2006). In task design, requesters describe tasks and design user interfaces for different task types. The interface provides a way for participants to view relevant information and provide answers. The requester often needs to avoid inter-task dependencies so that the outcome of one task does not affect another. The requester must also estimate the labor force required to perform the task.

(ii) Implementation is when the requester has published the task, and the participants become involved. If the task is complex and decomposable, the requester can decompose the task before it is forwarded to participants, so that the entire task can be more easily completed. The ability to assign tasks to participants according to their characteristics, or the task characteristics, is a key benefit of crowdsourcing as it ensures that the right tasks reach the right participants.

(iii) The final step, aggregation is bringing together the completed projects. After confirming that the result is satisfactory, participants are rewarded in the manner set out in the original task request (Basu, Lal, Srinivasan, & Staelin, 1985; Li & Wieringa, 2000). This can be either an intrinsic or extrinsic reward (Gassenheimer, Siguaw, & Hunter, 2013).

The results of the task verification stage are then used rank the users' reputations, which is forms a valuable future guide for other users. Depending on the application and task characteristics, it is sometimes possible for requesters and participants to rearrange or reassign jobs, redefine tasks and assign or execute new or related tasks, as long as it is within the remit of the original request.

2.4 Creative tasks

Task design has several components and the design and matching process of tasks is critical to the success of any CS project. Simple and clear tasks should be designed (Gurari et al, 2016). Creative tasks were the earliest form of crowdsourced project, in the form of competitions. These tasks depended on personal creativity and uniqueness, or co-creation and collaboration (Chiu et al, 2014).

Requesters crowdsourced creative tasks to find novel solutions to specific problems. As an incentive, participants were able to accept intrinsic rewards, such as being able to provide the most original and creative solutions to a project. Expert verification and auction strategiese developed from this approach and are now frequently used to select project winners for certain creative tasks (Tranquillini et al, 2015). Creative tasks are also a way to improve personal creativity in crowdsourcing. When the requester uses a solution from the participant's proposal, the worker contribution can be either selective or collaborative (Aris & Din, 2016). Some platforms such as InnoCentive and Threadless are well-known for being highly collaborative. Other crowdsource projects such as 99designs, design logos, 3D graphics and Wikipedia require a review panel to evaluate input and tasks before issuing rewards.

2.5 Intrinsic incentives

Intrinsic motivation is defined as: "To engage in an activity for internal satisfaction rather than for some separable result". Online communities perform tasks to eliminate the thirst for knowledge. Common dimensions of motivation are entertainment, personal development, learning, and philanthropy (Ryan & Deci, 2000). With regard to entertainment and learning, people seek entertainment when doing tasks, not complex problem solving. Gamification strategies help increase user contributions and make tasks attractive, engaging, and fun (Hamari, Koivisto, & Sarsa, 2014; Morschheuser, Hamari, & Koivisto, 2016; Seaborn & Fels, 2015).

Personal improvement is better suited to individuals that want to attain knowledge or skills. When participating in such tasks, people fulfil a need for personal growth through learning. There are also humanitarian, charity or altruistic workers. For example, in disaster or emergency situations, people spontaneously provide help to trapped people or victims. Contributing to a noble cause involves humanitarian and religious ideals and this kind of inner motivation is based on personal ethics (AlShehry & Ferguson, 2015). Another reward type is status, which is derived from competition. This relates to a worker's identity and is important when attracting people that will perform tasks related to community identity. Rewards are critical for people to perform tasks (Mason & Watts, 2009). Designing an appropriate incentive and reward structure greatly impacts the performance of participants and the quality of CS outputs (Xie, Lui, Jiang, & Chen, 2014).

Occasionally there is no discernable incentive to performing a task (Pilourdault et al, 2017). Intrinsic motivation describes when an individual is sufficiently motivated to complete a task, simply for the pleasure and interest that completing that task creates. This is an internal motivation structure that results in inner satisfaction, rather than a separable external result (Ryan & Deci, 2000). Intrinsic motivators are commonly found in fields of entertainment, personal advancement, learning, and philanthropy. When individuals experience fun, they sense that this is the reward, even for complex task situations. Some requesters disguise complex problems in entertaining ways to increase user participation rates and contributions. Gamification strategies create higher interaction and retention rates by using badges, leaderboards and scores to help participants earn esteem. This increases task attractiveness, engagement,

and entertainment. Other Gamification elements that are commonly used are stories and avatars (Hamari et al, 2014). Through satisfying a user's entertainment needs, online game players can be used to effectively solve problems.

Offering participants the opportunity for personal growth in terms of knowledge or skills is another form of reward (Byström & Järvelin, 1995). Other participants may wish to sacrifice personal time and effort for tasks that are humanitarian or egalitarian. Charity and altruism tasks are also common in crowdsourcing environments, particularly where there are disasters or emergencies. These incentives may be noble, humanitarian, or even religious, but the status that goes with selflessly offering time may involve competition and identity. Competition is frequently a co-factor in attracting people to tasks, as is community status.

3. Research methods

This paper will review the definition of terms used, then discuss typical system models, and then make specific assessments regarding the framework to be used in this paper. After a literature review, relevant articles for the different segments of the framework will be connected to the crowdsourcing process. It is necessary to undertake a comprehensive survey of all publications to ensure a rigorous methodological approach. For this reason, all literature after 2008 was considered.

Domain-specific terms searched for were "define or defining or definition", "framework", "task design", "task setting", "incentive or motivation", "assignment or allocation". Articles were retrieved from search engines and online resources, including Elsevier, ACM Digital Library, Science Direct, IEEE Xplore, Springer, and Google Scholar. Major journals and conference proceedings were also checked for source material. To avoid missing any relevant papers, the reference sections of selected papers in other databases were used. The majority of crowdsourcing research material was concerned with the participant internal incentive mechanisms, particularly where workers were completing creative design tasks.

This study used an internal incentive mechanism subscale of the incentive mechanism scale set by the self-compiled creative design task to understand the internal incentives related to the creative design task of crowdsourcing participants. Using a self-compiled creative design task set incentive mechanism subscale to investigate the internal factor incentive mechanism subscale. The designed scale was constructed in Google Docs and can be accessed online for free. Because many multi-step projects use a five-point Likert scale (1 for strongly disagree to 5 for strongly agree) it is possible to examine the internal incentive mechanisms for participants across projects when completing creative design tasks. The questions in the survey were related to specific dimensions known to be related to internal motivation. The four dimensions of internal motivation tested in this study were entertainment, personal development, humanitarianism, and status. Factors tested in the entertainment dimension were: fun, enjoyment, and gamification. The personal development factors tested were: knowledge, skills, satisfaction, desire to learn, habits, preferences and discoveries. On the humanitarian side, the factors tested were: altruism, charity, and civic responsibility. In the status dimension, the factors: competition, social and community status were tested. There were four dimensions and sixteen questions in total.

The survey received 43 valid responses. The Cronbach's alpha coefficient was used to test the reliability of the data responses. The output value should be greater than 0.8 and at least 0.7 for trustworthy data. The questionnaire asked respondents 16 questions regarding their internal motivation mechanisms with regard

to creative design tasks. A test for Cronbach's alpha coefficient was run in SPSS 26 and the results are presented in Table 1. The overall coefficient value was .884.

Table 1. Reliability statistics

Cronbach's Alpha	Number of items
.884	16

Table 2. Individual factor Cronbach's alpha results

Item	Cronbach's alpha
Fun	.877
Enjoyment	.872
Gamification	.877
Knowledge	.874
Skills	.870
Satisfaction	.872
Learning desire	.877
Habits	.872
Preference	.873
Discovery	.876
Altruism	.883
Charity	.884
Civic responsibility	.887
Contest	.875
Competition	.885
Social and community status	.880

The reliability analysis of the survey elements are represented by the coefficients shown in Table 2. Questions related to fun scored .877, enjoyment scored .872, gamification scored .877, knowledge scored .874, skills scored .870, satisfaction scored .872, learning desire scored .877, habits scored .872, preferences scored .873, discovery scored .876, altruism scored .883, philanthropy scored .884, civic responsibility scored .887, contest scored .875, competition scored .885, social and community status scored .880. In the Status dimension, factors such as contest, competition, social and community status were tested. The alpha coefficient value in Table 2 is between .80 and .90, indicating that the data has fairly good reliability, none of the 16 items needed removing.

In the Entertainment dimension factors tested included: fun, enjoyment and gamification. In the Personal Development factors tested included: knowledge, skills, satisfaction, learning desire, habits, preference, and

discovery. In the Humanitarian dimension, factor tested included: altruism, charity, and civic responsibility. In the Status dimension, factors as contest, competition, social and community status. In total there were four dimensions and sixteen questions.

4. Results

4.1 Pearson's Correlation Coefficients

The four dimensions of intrinsic motivation were also tested using Pearson's correlation coefficient and the test results are presented in Table 3.

Table 3. Correlation matrix for *entertainment* and internal incentive (N=43)

Entertainment	1	2	3	4
1.Fun	1			
2.Enjoyment	.42**	1		
3.Gamification	.55**	.36*	1	
4.Internal incentives	.62**	.70**	.61**	1

*p<.05   **. p<.01 ***. p<.001

It was found that fun [r(43)=.62, p<.001], and enjoyment [r(43)=.70, p<.001] had a significant positive correlation with internal incentive. Gamification [r(43)=.61, p<.001] also had a significant positive correlation with internal incentive.

Table 4. Correlation matrix for *personal development* and internal incentive (N=43)

Personal development	1	2	3	4	5	6	7	8
1.Knowledge	1							
2.Skills	.58**	1						
3.Satisfaction	.57**	.55**	1					
4.Learning desire	.41**	.59**	.56**	1				
5.Habits	.42**	.35*	.57**	.42**	1			
6.Preference	.38*	.45**	.55**	.58**	.47**	1		
7.Discovery	.25	.27	.52**	.35*	.49**	.63**	1	
8.Internal incentives	.70**	.74**	.73**	.62**	.72**	.68**	.62**	1

*p<.05   **. p<.01 ***. p<.001

Table 4 shows the correlation coefficients for the relationship between personal development and internal incentive. Knowledge [r(43)=.76, p<.001] and skills [r(43)=.74, p<.001] had a significant positive correlation with internal incentive. Satisfaction [r(43)=.73, p<.001] and learning desire [[r(43)=.62, p<.001] had a significant positive correlation with internal incentive. Habit [r(43)=.72, p<.001] and preference[r(43)=.68, p<.001] had a significant positive correlation with internal incentive; discovery [r(43)=.62, p<.001] also showed a significant positive correlation with internal incentive.

Table 5. Correlation matrix between *humanitarian* and internal incentive (N=43)

Humanitarian	1	2	3	4
1.Altruism	1			
2.Charity	.14	1		
3.Civic responsibility	.16	.62**	1	
4.Internal incentives	.46**	.42**	.42**	1

*p<.05   **. p<.01 ***. p<.001

The correlation coefficients in Table 5 show the connection between the humanitarian dimension and internal incentive. Altruism [r(43)=.46, p<.05] and charity [r(43)=.42, p<.05] both had a significant positive correlation with internal incentive. Civic responsibility [r(43)=.42, p<.05] also showed a significant positive correlation with internal incentive.

Table 6. Correlation matrix between *status* and internal incentive (N=43)

Status	1	2	3	4
1.Contest	1			
2.Competition	.67**	1		
3.Social and community status	.22	.29	1	
4.Internal incentives	.65**	.46**	.53**	1

*p<.05   **. p<.01 ***. p<.001

The correlation coefficient results of the relationship between the status and internal incentive are presented in Table 6. Contest [r(43)=.65,p<.001] and social and community status [r(43)=.53, p<.001] showed a significant positive correlation with internal incentive. Competition [r(43)=.46, p<.05] had a lower, but still positive correlation with internal incentive.

Of the 16 measurement factors, the correlation coefficients for 11 were at least .05, with some being highly significant, 5 items did not reach .05 and showed no statistical significance.

4.2 Linear Regressions

Following the Pearson Coefficient analysis, a series of linear regressions were run to test the relationships between fun, enjoyment, gamification and internal incentive motivation with regard to entertainment. The results are shown in Table 7.

Table 7. Linear regression of *entertainment* and internal incentive

Entertainment	B	SEB	β
1.Fun	0.14*	0.06	.25*
2.Enjoyment	0.27***	0.05	.49***
3.Gamification	0.14*	0.06	.29*
R^2	.685		
$Adj\ R^2$	.661		
F	28.31***		
df	(3,39)		

N=43

Table 7 shows that fun has a significant relationship with internal incentive, β=.25, p=.03, meaning that the higher the fun score, the greater the internal incentive. Enjoyment had a significant relationship with internal incentive, β=.49, p< .001, meaning that the higher the enjoyment score, the greater the incentive. Gamification and incentive had a significant relationship, β=.29, p=.01, meaning that the higher the gamification score, the greater the incentive. These results show that when completing creative design tasks, fun, enjoyment, and gamification are all motivational for participants. The degree of internal incentive derived from enjoyment is greater than the influence of fun or gamification.

Table 8. Linear regression of *personal development* and internal incentive

Personal development	B	SEB	β
Knowledge	0.18**	0.05	.23**
Skills	0.20***	0.04	.35***
Satisfaction	0.02	0.05	.03
Learning desire	0.01	0.04	.03
Habit	0.19***	0.04	.30***
Preference	0.06	0.04	.11
Discovery	0.14*	0.04	.21*
R^2	.911		
Adj R^2	.894		
F	51.45***		
df	(7,35)		

N=43

*p<.05　**. p<.01 ***. p<.001

Regression analysis was used to test the relationship between the personal development variable and internal incentive, and the results are presented in Table 8. The personal development variable included the factors: knowledge, skills, satisfaction, learning desire, habits, preferences, and discovery were examined. The results in Table 8 show that, knowledge and internal motivation had a significant relationship, β=.23, p<.05, meaning that the higher the knowledge score, the greater the internal incentive. Skills and internal incentive had a significant relationship, β=.35, p<.001, meaning that the higher the skills score, the greater the internal incentive. Satisfaction had no significant relationship with internal incentive, β=.32, p=.68; likewise, learning desire had no significant relationship with internal incentive, β=.33, p=.64. Habit and internal incentive showed a significant relationship, β=.30, p<.001, meaning that the higher the habit score, the greater the internal incentive. β=.51, p<. 001, the higher the habits score and the better the entertainment effect of the internal incentive mechanism. Preference had no significant relationship with internal incentive, β=.11, p=.15. Discovery had a significant relationship with internal incentive, β=.21, p <.05, meaning that the higher the discovery score, the greater the internal incentive mechanism. Discovery, skills and habit were the main internal motivators. There was a positive relationship between knowledge, discovery and internal incentive, but no discernable relationship between satisfaction, learning desire, and preference.

Table 9. Linear regression of *humanitarian* and internal incentive

Humanitarian	B	SEB	β
Altruism	0.24*	0.07	.39*
Charity	0.16	0.10	.24
Civic responsibility	0.11	0.08	.20
R^2	.372		
Adj R^2	.324		
F	7.71***		
df	(3,39)		

N=43

*p<.05   **. p<.01 ***. p<.001

Regression analysis was used to test the relationship between the humanitarian variable and internal incentive, and the results are presented in Table 9. There was a significant relationship between altruism and internal incentive, β=.39, p<.05, meaning that the higher the altruism score, the greater the internal incentive. There was no significant relationship between charity and internal incentive, β=.24, p= .14, and there was also no significant relationship between civic responsibility and internal incentive, β=.20, p=.22.

Table 10. Linear regression of *status* and internal incentive

State	B	SEB	β
Contest	0.37***	0.08	.61***
Competition	0.39	0.07	.07
Social and community status	0.28***	0.07	.41***
R^2	.592		
Adj R^2	.561		
F	18.85***		
df	(3,39)		

N=43

*p<.05   **. p<.01 ***. p<.001

Regression analysis was used to test the relationship between the status variable and internal incentive, and the results are presented in Table 10. There was a significant relationship between game and internal incentive, β=.61, p<.001, meaning that the higher the score of game, the greater the internal incentive. Competition and internal incentive had no significant relationship, β=.73, p=.60. Social and community status had a significant relationship with internal incentive, β=.41, p<.001, meaning that the higher the social and community status score, the greater the internal incentive.

5. CONCLUSION

A survey was issued, results were collected and the findings were tested using Cronbach's alpha, Pearson's Correlation coefficient and series of linear regressions. The results showed that respondents engaging in creative design based crowdsourced activities are aware of the internal incentive machanisms that form their reward. Entertainment was a particularly important dimension for participants to experience the re-

ward feeling. Gamification and fun appeared to be driving the primary incentive effect. In the Personal development dimension, improvement of skills and habits showed the greatest influence, followed by knowledge and discovery. Satisfaction, learning desire and preference showed no motivational effect in this study. In the humanitarian dimension, altruism was the key factor. Charity and civic responsibility were not considered to be a source of internal incentive. In the status dimension, participants found competition motivating.

Through competition, participants were able to obtain both social and community status; however, if they participated from a competitive perspective, their internal motivation was lower. Understanding the internal motivation mechanism of participants completing creative design tasks helps researchers, marketers, businesses and task requesters. Knowledge of how the different reward factors satisfy different motivational needs of participants can enable more appropriate task assignment, and improve the self-selection process. Many creative design tasks need to be completed within a limited time; however, only a limited number of participants can win material rewards. These participants also have very little interaction with each other, usually receiving messages indirectly through comments or ratings. Similarly, there are frequently no shared goals that must be accomplished as a team, or moral benefit for society. These less pivotal or life-changing design tasks are not psychologically rated by participants under the factor of civic responsibility or philanthropy. In this way, civic responsibility or philanthropy can conflict with the nature of crowdsourcing design competitions. The internal incentive mechanism is in the creative aspect itself. The uniqueness in the design task and the creative process is, for many participants, rewarding.

The results in this paper show that in creative design tasks, strengthening the internal motivation mechanism of participants can be done through increasing several factors. In order, these factors are: enjoyment, gamification, fun, skills, habit, knowledge, discovery, altruism, competition, and social and community status. When participants engage in creative design, it is a skill building activity, and through competition, social status is acquired. Working for "free" builds an altruistic habit.

Online crowdsourcing platforms, requesters, participants, and tasks all revolve around the internal incentive mechanism of the participants. Correctly assessing the internal incentive mechanism of prospective participants will ensure that people continue to join the network and participate actively.

The issues discussed in this paper are current and open research areas which need further investigation. Crowdsourcing offers potential gains to many industries and sectors of commerce. Additional research that supports the crowdsourcing industry would improve outcomes from the system and make them more stable.

References

1. Krizhevsky, A., Sutskever, I., & Hinton, G. E. (2012). Imagenet classification with deep convolutional neural networks. In *Advances in neural information processing systems,*1097-1105.

2. Muldoon, C., O'Grady, M. J., & O'Hare, G. M. (2018). A survey of incentive engineering for crowdsourcing. *Knowledge Eng. Review*, 33, e2,1-19.

3. Alkharashi, A., & Renaud, K. (2018, September). Privacy in crowdsourcing: a systematic review. In *International Conference on Information Security,*387-400. Springer, Cham.

4. Li, G., Wang, J., Zheng, Y., & Franklin, M. J. (2016). Crowdsourced data management: A survey. *IEEE Transactions on Knowledge and Data Engineering*, 28(9), 2296-2319.

5. Tarrell, N. Tahmasbi, D. Kocsis, J. Pedersen, A. Tripathi, J. Xiong, O. Oh, G.-J. De Vreede (2013). Crowdsourcing : A Snapshot of Published Research. Americas Conf. Inf. Syst. (AMCIS),1-14.

6. Aris, H. (2017) Current State of Crowdsourcing Taxonomy Research: A Systematic Review . In *Proceedings of the 6th International Conference* , 259,392-399.

7. Nassar, L., & Karray, F. (2019). Overview of the crowdsourcing process. *Knowledge and Information Systems*,60,1-24.

8. Berthon, P., Holbrook, M. B., Hulbert, J. M., & Pitt, L. (2007). Viewing brands in multiple dimensions. *MIT Sloan Management Review*, 48(2),37.

9. *R. Mihalcea, T. Chklovski Building sense tagged corpora with volunteer contributions over the web Recent Advances in Natural Language Processing III, 260 (2004),357.*

10. Weld, D. S., Wu, F., Adar, E., Amershi, S., Fogarty, J., Hoffmann, R., ... & Skinner, M. (2008).*Intelligence in Wikipedia Proc. AAAI ,8,1609-1614.*

11. Chittilappilly, A. I., Chen, L., & Amer-Yahia, S. (2016). A survey of general-purpose crowdsourcing techniques. *IEEE Transactions on Knowledge and Data Engineering,* 28(9), 2246-2266.

12. Liu, A., & Lu, S. C. Y. (2016).A crowdsourcing design framework for concept generation. *CIRP Annals, 65*(1), 177-180.

13. Silva, V., Schneider, D., Oliveira, L., & de Souza, J. (2017, April). Towards a framework for supporting community modeling in crowdsourcing systems. In 2017 IEEE 21st International Conference on Computer Supported Cooperative Work in Design (CSCWD),36-41. IEEE.

14. Ghezzi, A., Gabelloni, D., Martini, A., & Natalicchio, A. (2018). Crowdsourcing: a review and suggestions for future research.*International Journal of Management Reviews*, 20(2),343-363.

15. Tranquillini, S., Daniel, F., Kucherbaev, P., & Casati, F. (2015). Modeling, enacting, and integrating custom crowdsourcing processes. *ACM Transactions on the We*b (TWEB), 9(2), 1-43.

16. Pilourdault, J., Amer-Yahia, S., Lee, D., & Roy, S. (2017, March). Motivation-aware task assignment in crowdsourcing.

17. Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions.*Contemporary educational psychology*, 25(1),54-67.

18. Hamari, J., Koivisto, J., & Sarsa, H. (2014, January). Does gamification work?--a literature review of empirical studies on gamification. In *2014 47th Hawaii international conference on system sciences,*3025-3034. Ieee.

19. Gurari, D., Sameki, M., & Betke, M. (2016, September). Investigating the Influence of Data Familiarity to Improve the Design of a Crowdsourcing Image Annotation System. In *HCOMP*,59-68.

20. Chiu, C. M., Liang, T. P., & Turban, E. (2014). What can crowdsourcing do for decision support?. *Decision Support Systems, 65*, 40-49.

21. Saxton, G. D., Oh, O., & Kishore, R. (2013). Rules of crowdsourcing: Models, issues, and systems of control.*Information Systems Management, 30*(1), 2-20.

22. Hossain, M., & Kauranen, I. (2015). Crowdsourcing: a comprehensive literature review. *Strategic Outsourcing: An International Journal,8* (1),2-22.

23. Allahbakhsh, M., Benatallah, B., Ignjatovic, A., Motahari-Nezhad, H. R., Bertino, E., & Dustdar, S. (2013). Quality control in crowdsourcing systems: Issues and directions. IEEE Internet Computing, 17(2), 76-81.

24. AlShehry, M. A., & Ferguson, B. W. (2015). A taxonomy of crowdsourcing campaigns. Paper presented at the Proceedings of the 24th International Conference on World Wide Web.

25. Alt, F., Shirazi, A. S., Schmidt, A., Kramer, U., & Nawaz, Z. (2010). Location-based crowdsourcing: extending crowdsourcing to the real world. Paper presented at the Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries.

26. Amato, A., Sappa, A. D., Fornés, A., Lumbreras, F., & Lladós, J. (2013). Divide and conquer: atomizing and parallelizing a task in a mobile crowdsourcing platform. Paper presented at the Proceedings of the 2nd ACM International Workshop on Crowdsourcing for Multimedia.

27. Aris, H., & Din, M. M. (2016). Crowdsourcing evolution: Towards a taxonomy of crowdsourcing initiatives. Paper presented at the 2016 IEEE International Conference on Pervasive Computing and Communication Workshops (PerCom Workshops).

28. Basu, A. K., Lal, R., Srinivasan, V., & Staelin, R. (1985). Salesforce compensation plans: An agency theoretic perspective. Marketing science, 4(4), 267-291.

29. Blohm, I., Zogaj, S., Bretschneider, U., & Leimeister, J. M. (2018). How to manage crowdsourcing platforms effectively? California Management Review, 60(2), 122-149.

30. Brabham, D. C. (2008). Crowdsourcing as a model for problem solving: An introduction and cases. Convergence, 14(1), 75-90.

31. Brabham, D. C. (2010). Moving the crowd at Threadless: Motivations for participation in a crowdsourcing application. Information, Communication & Society, 13(8), 1122-1145.

32. Brabham, D. C. (2013). Crowdsourcing: Mit Press.

33. Bruns, A. (2007). Produsage. Paper presented at the Proceedings of the 6th ACM SIGCHI Conference on Creativity & Cognition.

34. Byström, K., & Järvelin, K. (1995). Task complexity affects information seeking and use. Information Processing & Management, 31(2), 191-213.

35. Campbell, D. J. (1988). Task complexity: A review and analysis. Academy of management review, 13(1), 40-52.

36. Chittilappilly, A. I., Chen, L., & Amer-Yahia, S. (2016). A survey of general-purpose crowdsourcing techniques. IEEE Transactions on Knowledge and Data Engineering, 28(9), 2246-2266.

37. Chiu, C.-M., Liang, T.-P., & Turban, E. (2014). What can crowdsourcing do for decision support? Decision Support Systems, 65, 40-49.

38. Doan, A., Ramakrishnan, R., & Halevy, A. Y. (2011). Crowdsourcing systems on the world-wide web. Communications of the ACM, 54(4), 86-96.

39. Estellés-Arolas, E., & González-Ladrón-de-Guevara, F. (2012). Towards an integrated crowdsourcing definition. Journal of Information science, 38(2), 189-200.

40. Füller, J., Hutter, K., & Faullant, R. (2011). Why co-creation experience matters? Creative experience and its impact on the quantity and quality of creative contributions. R&D Management, 41(3), 259-273.

41. Füller, J., Mühlbacher, H., Matzler, K., & Jawecki, G. (2009). Consumer empowerment through inter-net-based co-creation. Journal of management information systems, 26(3), 71-102.

42. Gassenheimer, J. B., Siguaw, J. A., & Hunter, G. L. (2013). Exploring motivations and the capacity for business crowdsourcing. AMS review, 3(4), 205-216.

43. Ghezzi, A., Gabelloni, D., Martini, A., & Natalicchio, A. (2018). Crowdsourcing: a review and suggestions for future research. International Journal of Management Reviews, 20(2), 343-363.

44. Gill, T. G., & Hicks, R. C. (2006). Task complexity and informing science: A synthesis. Informing Science, 9, 1.

45. Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work?--a literature review of empirical studies on gamification. Paper presented at the 2014 47th Hawaii international conference on system sciences.

46. Howcroft, D., & Bergvall-Kåreborn, B. (2019). A typology of crowdwork platforms. Work, Employment and Society, 33(1), 21-38.

47. Howe, J. (2006). The rise of crowdsourcing. Wired magazine, 14(6), 1-4.

48. Jones, G. R., & Jones, G. R. (2013). Organizational theory, design, and change: Pearson Upper Saddle River, NJ.

49. Kadadha, M., Otrok, H., Mizouni, R., Singh, S., & Ouali, A. (2020). SenseChain: A blockchain-based crowdsensing framework for multiple requesters and multiple workers. Future Generation Computer Systems, 105, 650-664.

50. Kohler, T. (2015). Crowdsourcing-based business models: how to create and capture value. California Management Review, 57(4), 63-84.

51. Li, K., & Wieringa, P. A. (2000). Understanding perceived complexity in human supervisory control. Cognition, Technology & Work, 2(2), 75-88.

52. Mason, W., & Watts, D. J. (2009). Financial incentives and the" performance of crowds". Paper presented at the Proceedings of the ACM SIGKDD workshop on human computation.

53. Morschheuser, B., Hamari, J., & Koivisto, J. (2016). Gamification in crowdsourcing: a review. Paper presented at the 2016 49th Hawaii International Conference on System Sciences (HICSS).

54. Nakatsu, R. T., Grossman, E. B., & Iacovou, C. L. (2014). A taxonomy of crowdsourcing based on task complexity. Journal of Information science, 40(6), 823-834.

55. Nassar, L., & Karray, F. (2019). Overview of the crowdsourcing process. Knowledge and Information Systems, 60(1), 1-24.

56. Nevo, D., Kotlarsky, J., & Nevo, S. (2012). New capabilities: can IT service providers leverage crowdsourcing?

57. Peng, X., Babar, M. A., & Ebert, C. (2014). Collaborative software development platforms for crowdsourcing. IEEE software, 31(2), 30-36.

58. Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. Contemporary educational psychology, 25(1), 54-67.

59. Seaborn, K., & Fels, D. I. (2015). Gamification in theory and action: A survey. International Journal of human-computer studies, 74, 14-31.

60. Shaw, A. D., Horton, J. J., & Chen, D. L. (2011). Designing incentives for inexpert human raters. Paper presented at the Proceedings of the ACM 2011 conference on Computer supported cooperative work.

61. Vakkari, P. (1999). Task complexity, problem structure and information actions: Integrating studies on information seeking and retrieval. Information Processing & Management, 35(6), 819-837.

62. Xie, H., Lui, J. C., Jiang, J. W., & Chen, W. (2014). Incentive mechanism and protocol design for crowdsourcing systems. Paper presented at the 2014 52nd annual Allerton conference on communication, control, and computing (Allerton).

63. Zheng, H., Li, D., & Hou, W. (2011). Task design, motivation, and participation in crowdsourcing contests. International Journal of Electronic Commerce, 15(4), 57-88.

眾包中創意設計任務的內因激勵機制分析

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摘要

眾包(Crowdsourcing)具有開放性創新、優化成本效益等優勢，更是設計發展的趨勢，一般的使用者透過網路進行數位化創意設計任務，本研究目的在瞭解創意任務中影響內因激勵的因素；研究結果從內部動機的四個維度：娛樂、個人發展、人道主義和地位發現：（1）娛樂是參與者體驗獎勵的最重要維度。（2）遊戲化和樂趣為推動娛樂方面主要激勵因素。通過激勵內因機制獎勵策略，提出未來的研究方向與建議，幫助運行新的創意設計任務獎勵策略，推展新的設計革命浪潮。

關鍵詞: 眾包、創意設計任務、內因激勵機制