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WHAT DRIVES THE CROWD? A META-ANALYSIS OF THE MOTIVATION OF PARTICIPANTS IN CROWDSOURCING

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Abstract

This paper presents the findings from a meta-analysis of the motivation of participants in crowdsourcing. We analysed quantitative primary studies of participation in crowdsourcing using meta-analytical statistical techniques. The findings of the meta-analysis are aggregated knowledge claims as far as they can be made based on the analysed studies and the available data. The findings show which intrinsic and extrinsic motivational factors are important, to which degree they are influential, and how much they are dependent on the particular context and type of crowdsourcing.

Keywords: Crowdsourcing, motivation, participation, human computer interaction, meta-model, meta-study, meta-analysis.

1 INTRODUCTION

Crowdsourcing has gained significant interest in research and practice over the past years (e.g., Pilz & Gewald, 2013). We understand crowdsourcing as “*a type of participative online activity in which an individual, an institution, a non-profit organization or a company proposes to a group of individuals of varying knowledge, heterogeneity and number, via a flexible open call, the voluntary undertaking of a task*” (Estellés-Arolas & González-Ladrón-de-Guevara, 2012, p. 9). Crowdsourcing is an umbrella concept covering a variety of sub-types of activities; yet these activities share sufficient common characteristics to be treated as one larger phenomenon (Kaganer, Caramel, Hirschheim & Olsen, 2013). One question that has and does centrally concerned researchers and practitioners is the question of what motivates people to participate in crowdsourcing activities (a participation which is, per definition, voluntary) (e.g., Füller, 2006; Kosonen, Vanhala & Blomqvist, 2014; Zheng, Li & Hou, 2011). Given the by all accounts rapidly increasing industry size of crowdsourcing, many people evidentially are motivated to participate.

Why do people participate in crowdsourcing? A variety of studies have been conducted to propose answers to this question. Certainly, the opportunity to earn money (if payment is offered) seems to be a key motivation factor (e.g., Brabham, 2010; Dombek, 2014; Leimeister et al., 2009). Furthermore, the opportunity to develop ones’ skills (by engaging in a challenging crowdsourcing activity) may also be a strong motivation factor (e.g., Füller, 2006; Kosonen, Gan, Vanhala & Blomqvist, 2014; Ståhlbröst & Bergvall-Kåreborn, 2011). Participants may also be motivated by obtaining reputation and recognition (e.g., Ipeiritis, 2010; Leimeister et al., 2009; Zheng, Li & Hou, 2011), see crowdsourcing activities as a form of entertainment (e.g., Brabham, 2008; Ståhlbröst & Bergvall-Kåreborn, 2011; Sun, Wang & Peng, 2011) or, in the case of charitable crowdsourcing, by altruistic considerations (e.g., Choy & Schlagwein, 2016; Gerber & Hui, 2013; Jackson, Østerlund, Mugar, DeVries Hassman & Crowston, 2015). These are just some illustration of the diversity of factors that have been claimed to motivate crowdsourcing participants.

While there now is a substantial number of empirical studies on the motivation of crowdsourcing participants, their findings have not been aggregated and integrated (e.g., Zhao & Zhu, 2014). Given the vast array of empirical studies on crowdsourcing motivation available, there is a need to systematically aggregate, integrate and evaluate what we actually know. Hence, we asked the research question: “*What do we know about what motivates people to participate in crowdsourcing?*”

To answer this question, we performed a meta-analysis, a systematic review method for empirical studies. We considered all available peer-reviewed “primary” empirical studies. The benefit of a meta-analysis is that it allows to draw more precise and better “generalizable” (or, “cross-context applicable”) conclusions as it considered a much wider and more diverse empirical base than individual primary studies and that it allows cross-comparisons across a wide array of empirical evidence (e.g., Kitchenham & Charters, 2007; Schreiber, Crooks & Stern, 1997; Walker, Hernandez & Kattan, 2008). In the meta-analysis, we first carried out a systematic literature search (Kitchenham & Charters, 2007) to identify primary studies of the motivation of crowdsourcing participants. We then used statistical meta-analysis techniques (Wolf, 1986) to aggregate quantitative primary studies. The study hence presents the best available knowledge today on the motivation of participants in crowdsourcing activities (based on published, peer-reviewed research). This study is the first such systematic meta-analysis.

This paper is structured as follows. Section 2 discusses the methods of the study (including the literature review method). Section 3 presents the findings of the respective parts the study. Section 4 discusses the contribution, implications and limitations of the findings. The paper concludes with a brief summary and outlook.

2 RESEARCH METHODS

2.1 Literature Review

In order to obtain a base of primary studies, we conducted a systematic literature search (Kitchenham & Charters, 2007). We used this method to identify all available empirical studies on the focal phenomenon of interest, motivation in crowdsourcing, based on a systematic, unbiased search strategy. For the purpose of identifying all primary empirical studies on a narrowly defined concept, a systematic literature search is considered to be an appropriate method even by critics (Boell & Cecez-Kecmanovic, 2015).

We started with an initial search to collect all possibly relevant primary studies. We performed our search on several scientific platforms: Google Scholar, IEEEExplore, ACM Digital Library, EBSCO and Proquest. We constructed search terms by combining keyword of group A (crowdsourcing, crowdfunding, open source, open innovation, user co-creation, peer production, user innovation) with one keyword of group B (motivation, incentives). We retrieve full-text of all papers and assessed their relevance.

In order for a study to be considered relevant for further analysis, the study had to meet the definition of crowdsourcing provided above (Estellés-Arolas and González-Ladrón-de-Guevara 2012), regardless of which terminology was used in the study. The study also had to be empirical, providing new and unique data. We only considered IT-based crowdsourcing, not offline open calls. Otherwise, we did while not impose any constraints regarding the crowdsourcing type, crowdsourcing context, or date of publication of the study. We also considered unpublished studies in order to avoid publication bias (academic outlets tend published more readily if results of a study are statistically significant, leading to underreporting of insignificance, Duval & Tweedie 2000).

In addition to keyword-based searches, we also conducted a forward and backward searches (Webster & Watson, 2002). The backward searches aimed to identify further studies by reviewing the citations of the papers (reporting studies) already identified as relevant. The forward searches aimed to identify further studies by identifying studies that cited the paper already identified as relevant.

We checked for duplicates within the base of primary studies and excluded duplicates (in some cases the same analysis of the same data was published in several papers). We did not exclude paper for being published in “lower quality” publication outlets. We considered all papers that were empirical, independently peer-reviewed or otherwise third-party examined, provided sufficient information about the data, and were transparent about the analysis performed. We identified 29 unique quantitative empirical primary studies on the motivation of participants in crowdsourcing activities.

2.2 Meta-Analysis

The quantitative studies in the identified set of primary studies were analysed through a meta-analysis. “Meta-analysis” refers to the application of statistical procedures to a collection of empirical quantitative findings in order to integrate and synthesize them (Wolf, 1986). The purpose of a meta-analysis is to overcome limitations of single primary studies, increase the empirical basis for any claims, identify consistency and contradiction between studies, and in some cases generate genuinely new propositions and hypotheses (Walker et al., 2008).

First, we aggregated and standardized motivational factors identified as relevant in the primary studies. That is, we consistently labelled factors that described the same concepts (same meaning) but were labelled differently (different words). For the process of aggregating and labelling motivational factors, we used the influential Work Preference Inventory (Amabile et al., 1994) as a standard reference framework. We generally tried to locate motivational factors in the Work Preference Inventory framework (even if labelled differently by the authors of any particular primary study) based on a comparison of the definitions and explanations given in the reviewed papers. In some cases, motivational

factors did not match with the Work Preference Inventory. For those cases we retained the factor as described in the reviewed papers.

Second, we analysed all pairwise relationships of the aggregated motivational factors to the key dependent variable, which was “likelihood of participation” in crowdsourcing (the likelihood of an individual deciding to participate in a crowdsourcing activity). The likelihood of participation was the most studied dependent variable in previous research, and was also the focal dependent variable of interest of our study. A pairwise relationship is a causal link between an independent variable and a dependent variable (Schepers and Wetzels 2007), the relation between the motivational factors (independent variables) and participation in crowdsourcing (dependent variable). While in principle possible with any number studies, meta-analysis is stronger in its claims if more independent studies (of relations) are available. Based on this rationale, we only included pairwise relationships into our quantitative analysis that have been independently studied at least five times. We did not make any differentiation between motivation for first-time participation and ongoing (or, repeated) participation because almost all reviewed primary studies did not make this distinction.

For each pairwise relationship, we collected all the individual effect sizes (Pearson correlation coefficients r) from all studies in which the relation was studied. The effect size is used to quantify the strength and direction of a relationship between two variables, ranging from -1 (indicating a perfectly negative linear relationship), to 0 (indicating no statistical relationship between the variables) to 1 (indicating a perfectly positive linear relationship). In case where the effect size was not provided by a primary study, but sufficient data was provided, we calculated the effect size by following procedures of Kim (2011) and Ellis (2010). In cases where neither the effect size nor sufficient data was provided, we approximated the effect size.

Finally, we aggregated all the individual effect size values to one overall, average effect size for each pairwise relationship. That is, we calculated the sample-size-adjusted (weighted) effect size for the same pairwise relationships examined across all studies (Hunter, Schmidt and Jackson, 1982). This allowed us to integrate the different results of the primary studies and make statements about the overall effect size across studies.

3 FINDINGS

The findings of the research according to the methods explained in 2.1 and 2.2 are reported in 3.1 and 3.2, respectively.

3.1 Findings from the Literature Review

The search process led to 388 papers that we considered potentially relevant and for which we obtained full texts (we found 333 through keyword searches, 40 through backward search, 13 through forward searches, conducted in this order). After reading the full-texts (as necessary) and applying inclusion and exclusion criteria, we identified 29 unique quantitative empirical primary studies on the motivation of participants in crowdsourcing activities (list available from authors on request).

The nature of the 29 quantitative studies was typically that they relied on survey data (using questionnaires asking participants about their motivations) or experimental data (providing different incentive mechanisms to different experimental groups to measure differences). The motivational factors were mainly based on previous models and literature, not based on the data (i.e., the paper used hypothetic-deductive logic). The aim of the studies was typically described as testing a model and finding out about statistical significance of effect sizes.

3.2 Findings from the Meta-Analysis

In the meta-analysis, after standardizing, aggregating and selection by count, we identified six salient factors (that are claimed to causally influence “likelihood of participation” in crowdsourcing). Table 1 shows the six factors, the number of studies, the cumulative samples size, and the weighted effect size.

Motivational Factors/Variables	Independent Primary Studies	Cumulative Sample Size	Weighted Effect Size
Enjoyment	9	4081	0.20
Challenge	13	5601	0.16
Outward recognition	11	4162	0.12
Compensation	9	4293	0.10
Sense of community	3	1165	Not calculated, less than five studies
Passing of time	3	1671	Not calculated, less than five studies

Table 1. *Salient Motivational Factors in Crowdsourcing and Their Effect Sizes (According to Meta-Analysis)*

The first column of table 1 shows the independent variable for which we found claims of a causal, pairwise relationship to “likelihood of participation” (in crowdsourcing). The wording and definition of these variables are based on the Work Preference Inventory (Amabile et al., 1994) and the reviewed literature.

Table 1 is to be read as follows. For the relationship between the “enjoyment” (referring to an individual's wish to feel pleasure, to have fun or to be entertained) of a crowdsourcing activity and the “likelihood of participation” in a crowdsourcing activity, we found a significantly positive weighted effect size (weighted Pearson correlation coefficient r^*) of 0.20 (based on a nine studies, with a total of 4081 observations). For the relationship between “Challenge” (referring to an individual's wish to improve skills, to enhance knowledge or to do something intellectually stimulating) and the likelihood of participation we found a weighted overall effect size of 0.10 (based on nine studies, with a total of 4293 observations). For the relationship between “Compensation” (referring an individual's wish to obtain monetary or material rewards) and the likelihood of participation we found a weighted overall effect size of 0.16. For the relationship between “Outward recognition” (referring to an individual's wish to obtain recognition from others or to express oneself towards others) and the likelihood of participation we found a weighted overall effect size of 0.12 (based on 11 studies with 4162 observations).

While there was not a sufficient number of studies to make the calculation of a weighted effect size meaningful, the reviewed primary studies also suggested a “sense of community” (referring to an individual's wish to belong to a group of like-minded people and interest communities) has statistically-significant positive impact on the likelihood of participation (according to three studies, with a total of 1165 observations). Finally, “passing of time” (referring to individual's wish to fight a sense of boredom, or to bridge a gap between other activities) also has statistically-significant positive impact on the likelihood of participation (according to three studies, with a total of 1165 observations). Note that “passing of time” was conceptualized differently from “enjoyment” in the primary studies (and hence we do so here), despite that these concepts share some similarity.

The above weighted effects of motivational factor on the participation are the best approximation that can be made based on the available data for a general theory of the motivation of participants in crowdsourcing (average effect sizes across all samples, regardless of type of context of crowdsourcing).

To assess to which degree these average effects can be said to generally apply across all different types/context of crowdsourcing (any particular “crowdsourcing” instance is different in tasks, contents, designs, etc.) or to be context-dependent, we calculated the minimum and maximum single study effect sizes, the quartiles and the weighted average mean effect size. Figure 1 shows the box plots of the four quantitatively analysed pairwise relationships.

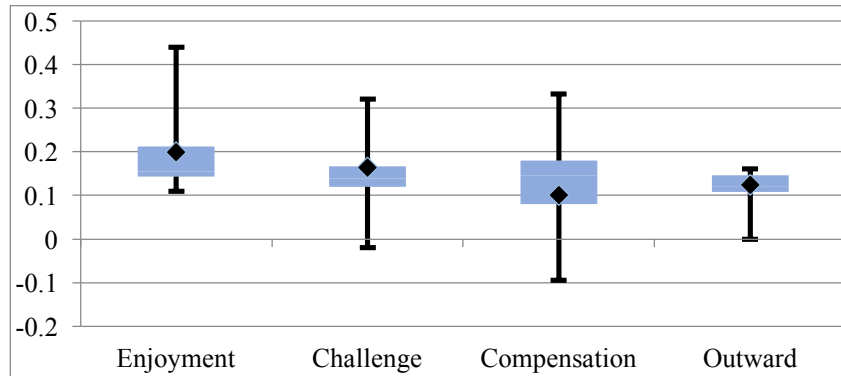


Figure 1: Variation in Effect Sizes of Motivational Factors

As figure 1 shows, the effect sizes for “enjoyment” varied between 0.11 and 0.44. The value for first quartile was 0.15 and the value for third quartile was 0.21. This indicates that enjoyment can be said to generally have a significant positive impact on participation. For “challenge”, the minimum effect size within the primary studies was -0.02 (non-significant), the maximum effect size was 0.32, the first quartile 0.12 and the third quartile is 0.16. This indicates a typically positively but not always significant impact on participation. For “compensation”, the findings are more mixed. The minimum effect size was -0.09 (significantly negative), the maximum effect size was 0.34, the first quartile was 0.08 and the third quartile was 0.18. This analysis shows that while compensation typically has positive impact on participation in crowdsourcing, this impact might under certain “outlier” circumstances actually be negative (e.g., this appears to be the case in pro-social/altruistically framed crowdsourcing). For, “outward recognition”, the minimum single study effect size within the primary studies was 0 and the maximum effect size was 0.16, first quartile is 0.11 and the third quartile is 0.14. This indicates a typically positively but not always significant impact on participation. The weighted average mean effect size is positive for all pairwise relationships. However, single study effect sizes partly vary substantially, indicating conflicting results in the primary studies (we will back come to this finding in the discussion section).

4 DISCUSSION

The salient motivational factors shown in table 1 answer the research question that we posed above (i.e., “What do we know about what motivates people to participate in crowdsourcing?”), based on the available analyses and their underlying data. The findings are based on the most extensive (re-)analysis of empirical data and studies available to date. The findings provided in table 1 provide an aggregated, unified, weighted model of what we quantitatively know about why a (typical) individual would or would not be motivated to participate in a (typical) crowdsourcing activity. The model also helps us understand why people may choose non-paying crowdsourcing (e.g., open source development) over paid-for crowdsourcing (e.g., development jobs on crowdsourcing marketplaces). This is because enjoyment, sense of community, learning, etc. are additional motivations that might out-weight reward-based economic motivations.

What are the implications of this study for future research?

This above model will be helpful as a baseline model for future theorising and Bayesian refinement. What we found in the analyses is that many of the identified motivational factors that have often been left out by many individual studies without apparent rationale. Yet, all of the above have been considered

important by a substantial number of other studies across many different crowdsourcing contexts. This suggests that none of the above factors should be excluded from consideration (i.e., not ignored in theories, surveys, treatments and interview guides) – unless a clear rationale for exclusion exists, a rationale which should be provided to the reader. Excluding factors without consideration and theoretical reasons, may lead to omitted variable bias and insufficient or incomplete explanation of the phenomenon (here, motivation to participate in crowdsourcing activities).

On a methodological note, we also would like encourage future authors to report their studies in ways that allow for meta-analyses such as above. This will allow more meaningful reviews of research, aggregation of knowledge, and benefit the academic discourse. We found that an insufficient declaration and explanation of the concepts and variables used was a common issue in the reviewed studies. Authors should provide definitions and explanations of the key concept they are dealing with in their arguments and theories. Some provided none at all, as if all terms were sufficiently self-explanatory (using certain terms does not provide sufficient explanation of concepts). This is not only a service towards the reader of such studies, but such clarification is also helpful for participants in the studies. For one example, we found that many constructs and items used within surveys did not specify their timely orientation. It was often not clear from the survey items whether participants were asked regarding their motivation based on an upfront expectation (such as for first-time participants) or based on past experience (such as for repeated participants), which to our mind makes a substantial difference and might, if clarified, be answered differently by the participants. Furthermore, many studies did not provide sufficient explanation regarding the specific context of the crowdsourcing activity and type of crowdsourcing studied. Ignoring even the most basic contextual factors (time, location, type of crowdsourcing, design of activity, etc.) may not only over-state the external validity of findings, but make it also impossible for meta-analysis (such as this one) to draw conclusions for, and compare, sub-types and sub-contexts within the larger crowdsourcing phenomenon. Finally, several of the primary studies lacked data and information needed to technically support a meta-study, which lead us to the use of “reverse engineering”, re-analyses of data and approximation and estimation techniques (all of which would not have been necessary if key data was actually provided in the original studies). We suggest researchers (and suggest that reviewers, editors and examiners request!) to provide the necessary data such as correlation coefficients of correlations, effect sizes of correlations, variance and standard deviation of variables and sampling distribution. Otherwise, publications of studies may serve the personal interest of the researchers, but not the interest of the academic community to build on and critically use published studies.

For practitioners in the crowdsourcing space, the model can be used as a guide and to comprehensively understanding the issues of motivation of participants. All of the factors identified have been shown to be relevant in several crowdsourcing studies and are hence worth consideration when creating and designing crowdsourcing activities (i.e., not all factors may be relevant in all contexts, but should be given serious consideration). For example, as above, the findings highlight that participants are not purely rational-economically motivated but that such factors as enjoyment and challenge are equally important.

There are several limitations of this study that should be clearly stated. This paper considers crowdsourcing as a sufficiently uniform phenomenon, with the motivations of a (typical) participant hence been able to be abstracted and generalized to a meta-model, with causal linkages between independent and dependent variables (this is hence to be read as a variance theory, see further Weber 2012). This is the philosophical worldview implied in the primary studies that are reviewed and aggregated here. Alternative philosophical approaches exist, such relational or process philosophies types (e.g., Orlikowski & Scott 2008, Seibt 2015), which would question some of the underlying assumptions (e.g., multiple interpretation instead of uniformity of nature) and would lead to different types of theory (e.g., process theory instead of variance theory). Further, this study (based on the reviewed primary studies) consider(s) a single points of observation. The study does not theorize a possible shift of motivational effects over time. For example, it seems reasonable that the curiosity and novelty of crowdsourcing might “wear off” over time (for each individual or for crowdsourcing in

general). Furthermore, partly due to incomplete data in the primary studies and partly due to the types of samples, the quantitative effect sizes should be seen as best available estimates, not precise values. Due to the nature of the meta-analytical approach, we could not test overlap between constructs beyond what the primary studies provided. The aggregation of constructs was necessarily based on a qualitative assessment of its contents and was not based on statistical strategies (see further Gefen et al. 2005, Hair et al. 2013). Despite these limitations, the findings provide the most comprehensive model of motivation of participants in crowdsourcing activities, based on the (all we could find) quantitative empirical studies and data available to date. We consider that the model is more comprehensive and that it will perform better in most cases than models based on subsets of the studies, parts of the data, or guesses ignoring the available literature and reported evidence.

5 CONCLUSION

The paper presented the findings from a study of the motivation of participants in crowdsourcing activities. In the underlying meta-analysis, we analysed all primary, empirical quantitative studies of participation in crowdsourcing activities that we could identify as such in a literature review process, using meta-analytical techniques. The findings of the meta-analysis will be useful as a baseline model for future studies.

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