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A Mixed Method Approach to Understanding Crowdsources' Engagement Behavior

Short Paper

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Abstract

With an increasing amount of arising crowdsourcing initiatives, insights are needed on how to successfully drive initial and sustained platform-activity, as a form of value co-creation between crowdsourcer and crowdsources. Therefore, the engagement concept, known as a micro-foundation of value co-creation, serves to holistically understand crowdsources' psychological and behavioral responses along the IT-mediated crowdsourcing journey. Due to the multidimensionality of the concept, a mixed method approach is proposed for exploring qualitatively and quantitatively stimuli's effect on psychological states and engagement behaviors. Therefore, two measuring approaches, the Sequential Incident Laddering Technique and a Panel Poisson Model, are presented. Preliminary findings suggest that, next to other factors, crowdsourcer-interaction and high-effort tasks serve as dominant drivers, fostering psychological engagement beyond the interaction process, while crowd-interaction rather drives within-process engagement behavior. This research in progress provides IS-researchers and practitioners initial insights into IT-enabled value co-creation processes.

Keywords: Crowdsourcing, value co-creation, engagement behavior, mixed method approach

Introduction

Crowdsourcing, coined after Howe (2006), is an emerging global trend, which 85 percent of the top hundred global brands try to take advantage of (Owyang 2015). It broadly defines a participative, IT-mediated activity in which a given entity proposes a task to a crowd to create mutual benefit (Blohm et al. 2013). While there are several functions of crowdsourcing, such as innovation or testing (Vivek et al. 2012), it seems as if practitioners' and researchers' primary attention is currently paid to assessing and managing contributions (e.g., Bayus 2013; Huang et al. 2014), rather than the crowd, its needs and desires throughout the interaction process. One possible reason for that maybe a unidimensional perspective on crowdsourcing success and value, often measured in terms of the quality or quantity of task-related output. However, the meaning of value and the process of value creation are rapidly shifting from a product- to an experience-based view (Prahalad and Ramaswamy 2004). This can be transferred to co-creation activities itself, in which experiences are created, too. Putting the concept of crowdsourcing in the broader context of value co-creation, value is not only supposed to be produced by tangible outcomes in form of contributions within the pre-defined project scope (i.e., instrumental value) but also through preceding processes (i.e., experiential value), sustainably affecting the crowd's perceptions and behaviors throughout and after

participation, directly and indirectly generating value for the crowdsourcer (Gebauer et al. 2013; Schulten and Schaefer 2015). As crowdsources may take on many roles, like a platform-mediated worker, community member, and (potential) consumer and influencer, the value of crowdsourcing is assumed to be multidimensional (Blohm et al. 2013) and may range from (over-) fulfillment of task and enhanced collaboration within the participation phase, to repeat participation, positive word of mouth, referral as well as consumption behavior, motivated through the interaction, after participation. In this context, actor engagement, suggested to be the micro-foundation of value co-creation (Storbacka et al. 2016), may serve as a relatively new concept for holistically assessing platform-mediated value co-creation activities. It is described as an interactive co-creative process in which the actor's internal disposition, often referred to as a psychological state (Brodie et al. 2011), is a central condition for the engagement activity, expressed in form of a behavioral response within the participation process. Without actor engagement, no resource integration can occur and consequently no value can be co-created. Moreover, it is argued that the conceptual and physical context determines why, when and how actors engage. Hence, engagement is inseparably linked to the overall perceived co-creation experience of an actor. Thus, to take a broader perspective on crowdsourcing, this paper proposes the concept of engagement as a relevant success driver. It is conceptualized as a process that models the underlying mechanisms, encompassing a cognitive, emotional and behavioral dimension, by which a crowdsourcer develops commitment based on perceived stimuli and prior experiences, resulting in diverse value-contributions towards the crowdsourcer (Troll et al. 2016). In fact, we assume that initial motivation and monetary incentive alone may not sufficiently satisfy and actively encourage crowdsourcing participants anymore (Zheng et al. 2011).

With an increasing amount of arising crowdsourcing initiatives and firm's growing desire for its strategic application to approach a mass of external resources of potentially great direct and indirect value (Bayus 2013; Zwass 2010), we argue that more concrete knowledge is needed on how to successfully drive psychological and behavioral engagement to foster value co-creation between crowdsourcer and crowdsources (i.e. participants). As psychological and behavioral explanations of platform-mediated participation and contribution are still vague and limited (Bayus 2013; Sun et al. 2012), and specifically no combined assessments of engaging crowdsourcing journeys can be found in the literature, first authors called for more research on that topic (Füller et al. 2009; Pedersen et al. 2013; Vuković 2009). Consequently, taking a focal actor stance (i.e., the crowdsourcer-perspective) and assuming that the crowdsourcer itself is engaged and has an interest in driving crowdsources' engagement, our goal is to identify relevant, experience-driving stimuli that foster an engagement-driving, psychological state and value-contributing responses among crowdsources, throughout and after the interaction process. Due to the multidimensional character of the engagement concept, a mixed method approach is proposed for investigating *why* and *how* crowdsources engage and thereby generating value, by:

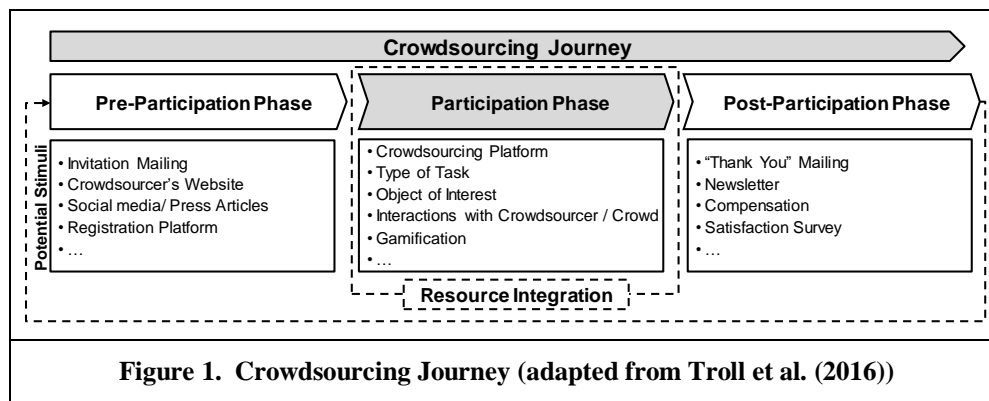
- 1) Qualitatively identifying experience-driving stimuli and their psychological effects throughout the end-to-end crowdsourcing journey, generating long-term-value for the crowdsourcer by assessing interview data from participants.
- 2) Quantitatively assessing stimuli's effects on behavioral responses within the participation phase, generating initial value for the crowdsourcer, by assessing platform-based interaction data.

To our knowledge, this is the first study, investigating stimuli's effects on behavioral and psychological engagement. Thus, providing researchers and practitioners holistic insights on how to foster direct and indirect value contributions, within (i.e., short-term) and beyond (i.e., long-term) the interaction process.

Value Co-Creation within the Crowdsourcing Journey

The fundamental idea of crowdsourcing is that a crowdsourcer (e.g., a company) proposes to an undefined group of contributors (e.g., individuals), called crowdsources, the voluntary undertaking of a task presented in an open call (Blohm et al. 2013). The ensuing interaction process unfolds over IT-based crowdsourcing platforms (Blohm et al. 2016). Therefore, crowdsourcers can set up their own platform and directly interact with crowdsources (e.g., *My Starbucks Idea*) or they can refer to intermediaries. Vuković (2009) differentiates between four types of crowdsourcing functions, representing the product or service lifecycle-part that is crowdsourced by the project: design and innovation, development and testing, marketing and sales, or support. Independent of the type and ultimate output-objective of a crowdsourcing project, crowdsourcer and crowdsources engage in the participative, IT-mediated interaction process to create mutual benefit (Estellés-Arolas and González-Ladrón-De-Guevara 2012). Thus, in a broader context,

it relates to the macro-construct of value co-creation (Storbacka et al. 2016), by which organizations open themselves to the co-creation efforts of external individuals (Zwass 2010). As crowdsources may take on several roles in this process, crowdsourcing value is assumed to be multidimensional. First, it may involve solving a crowdsourcer's problem that cannot be satisfactorily solved in-house (Blohm et al. 2016). However, benefits may go beyond problem solving as intention to crowdsourcing was found to be not only related to cost reductions and access to external talent, but also to enhanced brand visibility, reputation, and relationship-building with other parties (Ye and Kankanhalli 2015). Similarly, for crowdsources the benefit of participation can be of economic nature (e.g., reward or remuneration) or it may satisfy other needs like social recognition, self-esteem, skill development or entertainment, perceived throughout the interaction process (Estellés-Arolas and González-Ladrón-De-Guevara 2012). Accordingly, this paper argues that value goes beyond simple transactions and crowdsourcing success needs to be assessed more holistically. In this context, Storbacka et al. (2016) illustrate that actor engagement is the micro-foundation of value co-creation. Hence, actor engagement, defined as the internal disposition as well as the activity of engaging in an interactive process, is observable (i.e., empirically testable) and viewed as something longitudinally and conceptually broader than simple exchange-transactions (Storbacka et al. 2016). The perceived co-creation experience is supposed to be a major influencing factor. Based on the preceding research of Troll et al. (2016), the "*Crowdsourcing Experience*" is defined as a crowdsourcer's internal and subjective perception of the end-to-end IT-mediated crowdsourcing journey, accompanying a psychological state and behavioral responses. It is mainly an online experience, driven by several interaction points (i.e., stimuli) over one or more virtual channels. In this context, the "*Crowdsourcing Journey*" serves as a process model, comprising all interaction points from a crowdsourcer's perspective that may impact the crowdsourcing experience and associated engagement (Troll et al. 2016). It consists of three phases and several potential stimuli that may be perceived (Figure 1): 1) pre-participation phase (e.g., invitation, any upfront-communication, registration), 2) participation phase (e.g., crowdsourcing platform, task, interactions with other parties), 3) post-participation phase (e.g., compensation, any closing-communication). Within the participation phase major resource integration activities occur and key-outputs are generated, playing a key role for engagement formation and consequently value co-creation.



An Interdisciplinary Perspective on Engagement Formation

Due to the interdisciplinary character of crowdsourcing and the multiple roles of crowdsources four different perspectives of engagement seem suitable. First, user engagement is defined as a situational or enduring emotional, cognitive and behavioral connection between a user and a (technological) resource (Attfield et al. 2011), based on a user experience that extends beyond pure usability (O'Brien and Toms 2008). Behavioral responses (e.g., technology use, length, return) can be observed through interaction patterns (Attfield et al. 2011). Second, employee or work engagement commonly refers to a psychological state that is above and beyond simple satisfaction, as well as a behavioral response that includes e.g., innovative behaviors, proactive contribution, and over-fulfillment of task (Macey and Schneider 2008). Third, community engagement refers to the identification and interaction of community members within the group (Algesheimer et al. 2005). Brodie et al. (2013) identified learning, sharing, advocating, socializing and co-developing as relevant sub-processes. Lastly, consumer engagement is defined as a psychological state that occurs by virtue of interactive, co-creative customer experiences with a focal agent (Brodie et al. 2011), usually followed by responses in form of referral, word of mouth, knowledge contributions, or

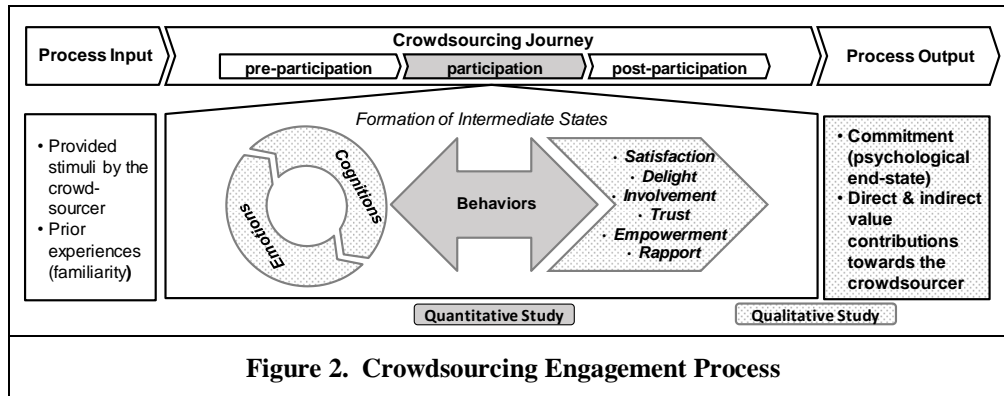
consumption (Kumar et al. 2010; Van Doorn et al. 2010). Although those definitions differ in terms of the engagement object (i.e., technology, employer, community, or a company) and resulting behavior (i.e., use, work, interact, consume), the underlying understanding of engagement is very similar. It can be summarized as a state that develops through a dynamic, iterative process that co-creates value between an engagement subject and an engagement object. This psychological state encompasses various combinations of cognitive, emotional, and behavioral dimensions, dependent on perceived stimuli and prior experiences (e.g., Brodie et al. 2013; Hollebeek 2011; Kahn 1990). The cognitive dimension can be interpreted as a more passive state of immersion and absorption (e.g., being stimulated) (Hollebeek 2011; Hollebeek et al. 2014) or a more active state of cognitive processing to expedite comprehension (e.g., reasoning) (Mollen and Wilson 2010). The emotional dimension relates to the feelings, activated by an experience (e.g., excitement). Based on those stimulus perceptions and prior experiences, an intermediate, psychological state is generated (often unconsciously), followed by a behavioral response (Bowden 2009; Sashi 2012). Generated intermediate states with related responses throughout the journey influence the development of the final engagement state, expressed in form of two types of commitment, implying calculative- (i.e., rational or economic-based commitment due to perceived utility or lack of alternatives) and affective commitment (i.e., a psychological closeness to a focal agent) as well as related value contributions towards the engagement object (Bowden 2009; Mollen and Wilson 2010; Sashi 2012). Commitment is known as a “forward-looking” dimension, by which an individual has the desire to maintain a relationship with an engagement object (Gustafsson et al. 2005), associated with direct (e.g., return) as well as indirect (e.g., positive word of mouth) value contributions (Bowden, 2009; Sashi, 2012).

Crowdsourcing Engagement and Stimuli-Assessment

Independent of the crowdsourcer's original intention, we argue that performing a crowdsourcing initiative creates an experience that may or may not foster engagement through the process of co-creation. Henceforth, *Crowdsourcing Engagement* is conceptualized as a process that models the underlying mechanisms by which a crowdsourcee develops commitment, based on perceived stimuli throughout the crowdsourcing journey and prior experiences, resulting in value-contributions towards the crowdsourcer. This process is illustrated in Figure 2. Moreover, diverse stimuli along the IT-mediated crowdsourcing journey likely address all three experience dimensions, arousing diverse intermediate states. We identified *satisfaction*, *delight*, *involvement*, *trust*, *empowerment*, and *rappor*t as potentially relevant intermediate states as well as related stimuli-characteristics that drive engagement in the case of crowdsourcing. *Satisfaction* is achieved, when performance of an object meets or exceeds one's expectations within a normal range (Oliver et al. 1997). It is assumed to become less significant for engagement formation when stronger mechanisms operate (Oliver 2014). When a stimulus is perceived as surprisingly positive (i.e., positive affect, disconfirmation, and surprise) it is referred to as *delight* (Oliver et al. 1997). As *delight* occurs due to attribute-based evaluations, it may also be perceived by unfamiliar participants. *Involvement* relates to perceived importance and personal relevance, known as a goal-directed motivation (Mittal and Lee 1989) and viewed as an important engagement driver (Gordon et al. 1998). *Trust* is the assumption that a focal agent is able to respond to someone's needs and has one's best interest at heart (Delgado-Ballester and Luis Munuera-Alemán 2001), having a positive impact on affective connections and risk-perceptions (Hess and Story 2005). *Empowerment* is defined as the perceived influence on decisions, a feeling of enablement and competence to solve a task (Füller et al. 2009), leading to stronger commitment, demand, and word of mouth due to a sense of psychological ownership (Fuchs et al. 2010; Ulrich 1989). Lastly, *rappor*t is defined as the personal, enjoyable and harmonious connection that is formed within customer-to-provider interactions (Gremler and Gwinner 2000). It reflects the interactive nature of co-creation processes and fosters long term connections through affective commitment (Brodie et al. 2011).

Assuming those psychological engagement-effects of promising stimuli, a corresponding behavioral response is supposed to follow. Nguyen et al. (2015) suggest four measures for assessing behavioral engagement in the context of crowdsourcing: 1) the magnitude (i.e., amount of effort) and type (i.e., significance of contribution), 2) temporal intensity (i.e., sustained nature of contributions over time), 3) diversity (i.e., variety of activities), 4) and recency (i.e., time of last activity) of tangible effort, crowdsources devote to solve the given tasks. By that, special focus is put on the activity and not the work-outcome itself (e.g., quality), which fits the broader perspective of engagement. Furthermore, corresponding platform data can be collected. Besides, content-related measures through text-mining can be used as indicators of psychological engagement states, as most definitions describe engagement as an emotional and positive

state (Alm et al. 2005; Danisman and Alpkocak 2008; Vivek et al. 2012; Weigl 2008). From community research, we know that diverse behavioral engagement profiles exist, whereas participation inequality is a very common phenomenon (Nonnecke and Preece 2000). In online communities often a 90:9:1-distribution can be observed, meaning that 90% of participants are mostly passive, 9% show mediocre engagement, and 1% show top participation (McConnell and Huba 2007).



By looking at the crowdsourcing journey, potential engagement-driving stimuli, fostering those intermediate states and responses, can be discussed. In service research, Berry et al. (2006) differentiate between functional, mechanic and humanic clues that affect a consumer's thoughts, feelings and subsequent behavior, when experiencing a service. While functional clues (i.e., service quality) relate more to a kind of hygiene-factor, which are assumed to arouse only cognitive dimensions and may lead to dissatisfaction if not performing well; mechanic- (i.e., service features) and humanic (i.e., service providers) clues additionally have the potential of emotionally arousing consumers, differentiating a service from another and fostering loyalty behavior (Berry et al. 2006; Brodie et al. 2011; Kano et al. 1984). The general assumption is that quality aspects only have the potential to generate satisfaction at most by meeting a consumers service expectations and leading to a state of indifference (Oliver 1977). In comparison, humanic clues are supposed to arouse *rappor*t with the focal agent or other customers, if an interaction is perceived as enjoyable (Gremler and Gwinner 2000; Wu 2007); or *empowerment* through the perception of encouragement, fostering a sense of meaning, competence, self-determination, and impact (Macey and Schneider 2008). Moreover, mechanic clues may arouse delight due to the perceptions of e.g., novelty, aesthetics, and fun (Attfield et al. 2011; O'Brien and Toms 2008; Oliver et al. 1997). As explained before, those states are assumed to positively affect the experience evaluation and foster engagement behavior. This logic can be transferred to the field of crowdsourcing to identify potentially relevant clues (i.e., stimuli), that foster engagement. To generate a unique crowdsourcing experience, next to functional factors (e.g., platform quality) that must work well to avoid sudden discontinuance, we propose two types of humanic- and one mechanic interaction that may operate as critical, experiential stimuli, potentially arousing emotions among crowdsourcers and positively affecting sustained participation behavior: a) crowdsourcer-to-crowd interaction, b) crowd-to-crowd interaction, and c) platform-to-crowd interaction through the mechanism of gamification. Similar to the traditional consumption setting, those interactions are supposed to arouse rapport (i.e., an enjoyable, personal connection with the crowdsourcer or a sense of community and group belonging with other crowd-members), empowerment (i.e., a sense of impact and ownership due to interactions with the crowdsourcer), and delight (i.e., perceived fun and surprise from gaining badges and status points from the crowdsourcing platform), thereby strengthening psychological and behavioral engagement, and thus value for the crowdsourcer.

Initial research on exploring individual types of those stimuli in a crowdsourcing context, identified through a systematic literature review, reveals that so far mainly self-reported perceptions through structured surveys exist, providing divergent insights on psychological effects and intentions. For example, survey results illustrated that feedback on the crowdsourcing platform generally affected emotions but not behavior, without differentiating between the feedback sources and types of emotions (Boons et al. 2015; Martinez 2015); while other surveys showed that crowdsourcer-interaction was found to be explicitly desired (Deng et al. 2016; Jeppesen and Frederiksen 2006; Leimeister et al. 2009; Schäfer et al. 2017). In comparison, other studies (case study research, surveys, and mental experiments) point out that especially crowd-collaboration was positively perceived, influencing satisfaction and participation-intention (Brawley

and Pury 2016; Kohler et al. 2011; Literat 2017; Schulten and Schaefer 2015). While providing valuable insights into the psychological component of engagement, no knowledge concerning the realized value co-creation can be derived. Those few existing studies, using actual behavioral platform-data, either serve contradicting or limited results due to their immaturity. For example, by using behavioral data from the Dell-crowdsourcing case, crowd-interaction was found to positively impact the amount of ideas, while crowdsourcer interaction only positively impacted idea-quality (Chen et al. 2012). In comparison, Chan et al. (2015) observed that only repeated interaction with the same crowd-member impacted idea generation, while crowdsourcer interaction was positively related to idea submission. Those studies also do not account for the more holistic idea of participant engagement, as only interaction effects on one type of response (idea submissions) are tested, ignoring other types and measurements of potential responses, indicating engagement and contributing (direct or indirect) value. In response to that, Nguyen et al. (2015) illustrate in a pilot-study that participants from projects with crowdsourcer interaction have higher engagement values than in other projects, by using an index with diverse behavioral data. Lastly, one research in progress project proposes positive effects of gamification elements on different types of responses (Antin and Churchill 2011). However, no existing study interlinks qualitative and quantitative research methods for gaining deep insights into the combined effects of mechanic and humanic interaction clues on psychological and behavioral effects. This seems to be especially relevant in a crowdsourcing context, representing a socio-technical system of multidimensional value, in which members are potentially stimulated by technological and interpersonal factors (Germonprez and Hovorka 2013).

While those early findings generally seem to strengthen the assumption that crowdsourcer-, crowd, and platform-interaction positively impact engagement, they imply methodological and design-related weaknesses, on which base one cannot derive concrete knowledge on how to design initially and sustainably engaging crowdsourcing experiences. Consequently, for our research model, we propose three types of interactions, stimulated by a) the crowdsourcer, b) the crowd, and c) the platform, positively impacting participants' engagement, suggesting a mixed method approach that combines innovative research designs for gaining in-depth knowledge on psychological and behavioral effects along the crowdsourcing journey.

Research Design

By referring to the “expansion strategy” to extend the breadth and range of inquiry by using mixed methods for different inquiry components (Greene et al. 1989), first, a qualitative study is conducted to explore the impact of engagement-driving stimuli on psychological effects with long-term impact on the engagement state and post-participation value. Secondly, a quantitative study, based on interaction data from a crowdsourcing platform is proposed, for assessing behavioral responses to related pre-identified stimuli as a form of short-term effects, generating direct value within the participation phase.

Qualitative Study

In-depth interviews (May-July 2016; 60-90 minutes) with crowdsourceres from three common crowdsourcing cases, in the field of software testing (i.e., usability-, bug-testing, idea submission) with potential end-users and comparable journey-designs, were conducted to decipher the crowdsourcer's experience and engagement-driving stimuli. Twenty-three crowdsourceres could be randomly selected that corresponded with pre-specified criteria for reasons of comparability (similar cultural background (Swiss), income level (middle-class); some familiarity with crowdsourcing and crowdsourcer). A slightly adapted version of a novel interview approach for assessing service experiences, the “Sequential Incident Laddering Technique” (SILT) (Jüttner et al. 2013), was used to establish the link between stimuli, perceived along the journey and crowdsourceres' (a) cognitive and emotional perceptions; (b) intermediate states; (c) and behavioral responses. Lastly, crowdsourcer's final commitment and behavior towards the crowdsourcer was surveyed. A detailed description of this approach can be found in the research-in-progress paper from Troll et al. (2016). Throughout the interviews, special attention was given to the perception of interaction-related stimuli due to their assumed importance for engagement formation. Yet, by using the SILT approach, asking interviewees to reflect on their end-to-end crowdsourcing journey, also other stimuli could be explored, thus allowing for the exploration of potentially unexpected factors.

Preliminary Results from the Qualitative Study

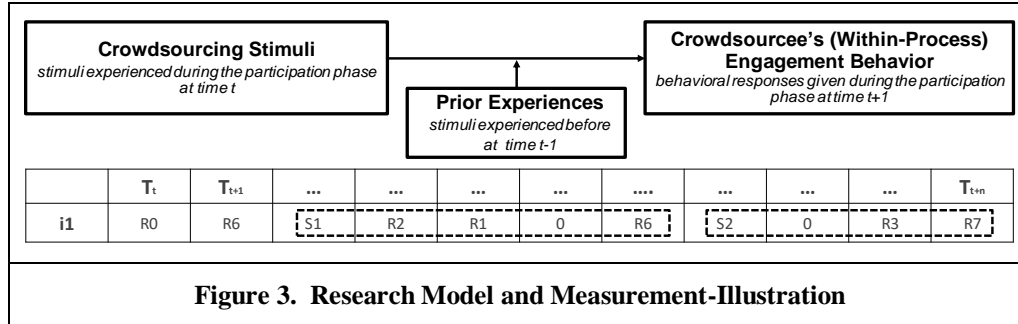
Findings from all three cases confirmed that crowdsourcer-interaction in the pre-participation (i.e., upfront communication) and participation phase (i.e., interaction for encouragement, support, and inquiries) led to descriptions of strong emotional responses, arousing rapport and empowerment among crowdsources with long-term effects on engagement states and behaviors at the end of the journey. Interviewed crowdsources enjoyed the attention, fast responses, and felt more enabled to contribute (e.g., "It was nice to get to know some people behind the scenes"; "I reported a problem and they quickly called me. Nice people!"; "their quick and friendly response left a lasting impression"). Those interviewed crowdsources, who had positive experiences with the crowdsourcer, reported to feel more affective committed and mentioned more (actual or planned) diverse value-contributions after participation. In comparison, perceived low amount of interaction with the crowdsourcer and slow or no response led to frustration and dissatisfaction (e.g., "When I voluntarily work for them, I would expect some response. (...) Yes, I felt disappointed and won't do it again"). Interestingly, crowd-interaction seemed to lead to no or only very limited emotional responses among interviewees and aroused mainly a state of satisfaction with no lasting effect on the final engagement state (e.g., "I only interact with the others [crowdsources] when I have a problem"; "It doesn't make me feel more proud to get comments from others. It is just a part of the process"). Similarly, interactions with the crowdsourcing platform due to gamification effects (e.g., earning badges) aroused no specific emotions in any case and are assumed to play a rather minor role for long-term engagement. Nevertheless, although not specifically predicted, the task generally seemed to play a more critical role. The ones, who participated in more challenging, creative types of tasks (e.g., submitting ideas), responded more emotionally concerning this stimulus and expressed delight, empowerment, and involvement due to the enjoyment, surprise, perceived impact, and a positive feeling of challenge (e.g., "I was surprised about the think-aloud videos. I felt excited to try that out!"; "the realistic scenarios were interesting, I felt like a real customer."; "I knew my feedback counts"). Quick assessments of their interaction data illustrated that involved and empowered crowdsources were also observed to spend more time with the test object, did more than was expected in the task, and gave more detailed feedback in terms of word count. In contrast, crowdsources who felt bored evaluated the task (e.g., bug-and content-testing) as dissatisfying, left the test-site earlier, and provided less feedback (e.g., "the tasks were simply too meaningless, waste of time"; "boring, too easy"). Emotionally aroused crowdsources described themselves to be more affective committed and a desire for repeat participation and positive word of mouth. Hence, the type of task is assumed to play a dominant role for psychological long-term engagement. Other stimuli, as the registration process, the crowdsourcing object that was in the center of the task (here a website or app), general platform use, and post-participation communication was found to have minor effects on engagement states and mainly led to satisfaction within a normal range or even dissatisfaction, as predicted.

Consequently, this study provided valuable insights into the impact of several stimuli on the psychological effects throughout the end-to-end journey. We confirmed that crowdsourcer-interaction has a major impact on engagement formation from a psychological perspective with long-term effects beyond the actual project scope, generating additional indirect value contributions for the crowdsourcer. Additionally, due to the holistic approach for investigating end-to-end experiences, high effort-tasks were also found to be especially relevant for engagement formation and long-term effects. Surprisingly, crowd-interaction and gamification seems to play a minor role in this process, against the predictions, based on prior research.

Quantitative Study

In a next step, we quantitatively assess direct engagement effects of those stimuli on response behavior within the interaction process to explore potential similarities and differences towards the qualitative study and to provide explanations for divergent findings from prior studies. Therefore, we use time-stamped interaction data from almost 12.000 crowdsourcing journeys, collected from a platform of one of the prior assessed cases. A general research model is developed and illustrated in Figure 3. We assume that specific crowdsourcing stimuli S at time t (S_t), experienced during the participation phase, positively impact the likelihood of a crowdsourcer's (i) subsequent response behavior at time $t+1$ (R_{t+n}) during the participation phase, moderated by prior experiences with those specific stimuli at time $t-1$ (i.e., we assume a lower effect with prior familiarity, as expectations grow and the probability of emotional arousal decreases). To measure those relationships within real crowdsourcing cases, stimuli-related data need to vary along journeys. Crowdsourcer- and crowd-interaction, gamifications elements as well as different types of tasks can be measured as potential independent variables with journey data. Based on our findings from the literature

review and the qualitative study, we assume crowdsourcer interaction and type of task as dominant engagement drivers, supposed to affect not only psychological but also behavioral engagement outcomes within the interaction process. Thus, we hypothesize that experienced crowdsourcer interaction is positively related to the likelihood of crowdsources' subsequent engagement behavior within the participation phase (H1), due to the effect of rapport and empowerment. Second, we hypothesize that crowdsourcer's participation in high-effort tasks (i.e., more demanding tasks in terms of complexity or creativity) is more positively related to the likelihood of subsequent engagement behavior within the participation phase (H2) than crowdsources participation in low-effort tasks, due to the effect of delight, empowerment, and involvement. We expect the stimuli crowd interaction and gamification to have only limited effects on engagement behavior, as they aroused no emotions and only led to satisfaction states. Hence, we hypothesize that crowdsourcer interaction has a stronger (i.e., more positive) effect on the likelihood of crowdsourcer's subsequent engagement behavior than crowd interaction, within the participation phase (H3). We still control for the potential non-dominant stimuli to test for unexpected deviations.

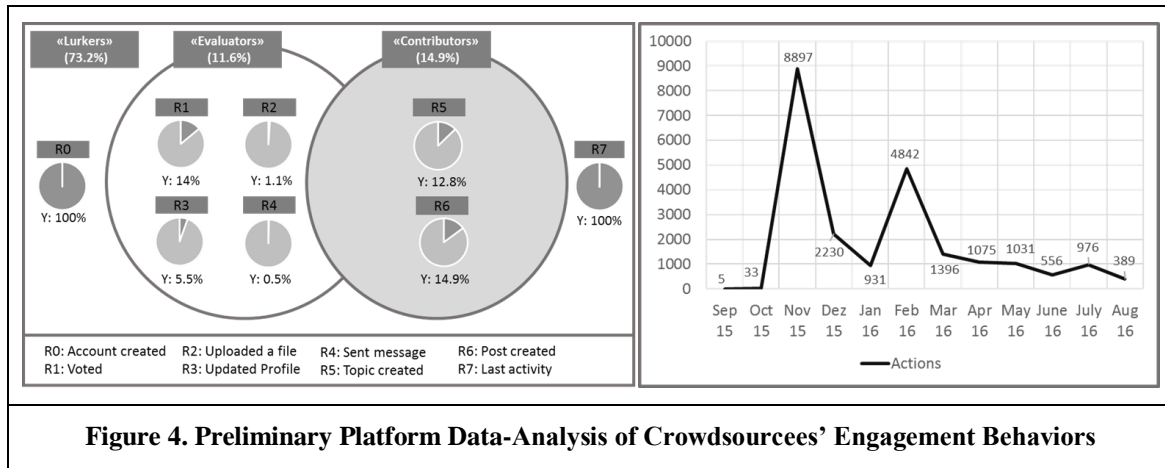


Due to a sequence-based logic in our data set, the unit of analysis comprises a crowdsourcing stimulus followed by all responses until the next stimulus occurs. Hence, the independent variables (S) varying over individuals and time, are measured as dummy variables. For the chosen case, the stimulus crowdsourcer interaction (S1) has the value 1 when: a) a private message was sent to the crowdsourcer; b) response posted to a crowdsourcer's contribution by the crowdsourcer. The stimulus crowd interaction (S2) has the value 1 when: a) private message was sent to the crowdsourcer; b) response posted to a crowdsourcer's contribution by another crowdsourcer. The stimulus high-effort task (S3) has the value 1 when a contribution was made to the task-category "idea submission" and the value 0 when the task "bug submission" or "poll" was approached. Lastly, the stimulus gamification, is controlled for in the model with the value 1, when a badge was received. The moderator "prior experience" is an integer (i.e., the amount of prior stimuli perceived). Furthermore, the dependent variables (R), all possible response types, are measured as positive integers (counts) and evaluated in terms of their meaning for engagement (level of effort) and value for the crowdsourcer (project relevance): voting on a topic or post (R1); file upload (R2); profile update (R3); sent private message (R4); contribution-creation (topic) (R5) or response-creation (post) (R6) in the category of ide or bug. Based on the evaluation, we group low and high-effort/impact contributions (LC=R1-R4; HC=R5-6). Response-variables are measured in terms of the amount and type of activities (i.e., magnitude indicator), the time between the stimuli and first response activity that followed (i.e., adapted form of the recency indicator), and concerning the number of different types of responses (i.e., diversity indicator). Hence, different estimation models are planned (S_{it}=sum-variable with the total amount of all response types (M1); time (M2); diversity (M3); amount of each type of response-measure (M1a-f)). Further, a control variable will be included in the analysis with the value of 1, when text-based contributions (i.e., topics, posts, messages) are identified as positive, emotional. Each sequence has a maximum time length of one week, meaning that individual responses are only related to a stimulus within 7 days and all responses beyond (as long as no other stimulus appears) are cumulated and termed "lagged" responses. This ensures that we can account for direct responses with a greater likelihood of being causally related to the stimulus and control for lagged responses in a separate model to differentiate between initial and sustained behavioral effects within the journey. As an estimation strategy, we propose a panel Poisson regression model, since the dependent variable is a count.

Preliminary Results from the Quantitative Study

The data-analysis illustrates that almost 15% of all crowdsources belong to the group of active contributors as they created at least one post and topic (HC), while around 12% occupied a more evaluating role by

responding to less engaging activities (LC). 73% stayed passive over the crowdsourcing-lifecycle (Figure 4). Concerning the 90:9:1-rule, the given crowdsourcing case seems to illustrate a success-case, as behavioral engagement within the crowdsourcing process is relatively high. Moreover, a declining behavioral engagement-curve can be observed, as it is common to many crowdsourcing projects (Bayus 2013).



In a first step, we conducted simple, individual, multiple regression-models to assess the effect of S1 and S2. From the regression outputs, it can be observed that the sum variable, including all response types within a 7-day range as well as the diversity indicator are not significant for crowdsourcer and crowd-interaction. However, looking at the individual response types, it can be observed that S1 and S2 negatively affect LC, while HC are positively affected. S1 has a slightly stronger negative effect on LC (10%), while S2 has a stronger positive effect on HC (18%). Interestingly, by looking at the lagged effects, the negative effect of both stimuli on LC contributions turns into a positive one, while HC stay positively affected. In line with that, stimuli impact on the sum variable of responses becomes significant and positive, while the diversity indicator stays insignificant. While S2 has a slightly stronger positive effect on LC, crowd-interaction keeps its stronger positive impact on HC. Based on those preliminary findings, we need to differentiate between response types due to stimuli's diverse impact, especially when investigating initial effects. Participants seem to focus more on HC after experiencing crowdsourcer- and especially crowd-interaction, while LC are reduced initially. Although the study is not completed, those observations give interesting and surprising insights in the differences between stimuli's effect on psychological, long-term effects and behavioral, short-term effects. While for the final engagement state and beyond-process behavior, crowdsourcer interaction was identified as a primary factor; for within-process behavioral contributions, crowd-interaction seems to be a dominant driver. Hence, differences in importance and role of specific stimuli for engagement formation may be assumed. Further investigations and more enhanced analytical approaches are planned.

Conclusion

Introducing the multidimensional concept of engagement for holistically understanding crowdsources' responses towards experience-driving stimuli along the crowdsourcing journey and providing relevant concepts, definitions and sequence-based measurement approaches, offers IS-researchers novel knowledge in the field of IT-enabled value co-creation processes. It is the first study that interlinks qualitative and quantitative research methods for gaining deep insights into the combined effects of mechanic and humanic interaction clues on psychological and behavioral short- and long-term effects, especially relevant in a crowdsourcing context, representing a socio-technical system of multidimensional value. The goal is to extend existing knowledge and dissolve contradictory findings from prior studies by providing more advanced and detailed insights, e.g. by using sequence-based data (subjective and objective), incorporating time-dimensions (initial and sustained effects), and considering a holistic definition of engagement (considering a diverse range of response types). Additionally, the study will provide insights into the specific roles of different interaction types for engagement effects, within and beyond the process. Lastly, it will support practitioners with novel knowledge on which conclusions regarding crowdsourcing journey design and -management can be derived, depending on their specific engagement- and value contribution goals in terms of crowdsources' activity-level (direct value) and sustained loyalty (indirect value).

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