Inspiring crowdsourcing communities to create novel solutions: Competition design and the mediating role of trust

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ABSTRACT

Online communities have become an important source for knowledge and new ideas. However, little is known about how to create a compelling virtual experience to inspire individuals to make novel contributions. This examination is crucial as participants' time and attention have become increasingly scarce resources in an ever more crowded online space. Drawing from the motivation through job design theory, we develop and test a research framework to examine how motivation can be influenced or triggered by competition design characteristics to drive creativity in crowdsourcing communities. Specifically, we investigate the importance of task and knowledge design dimensions in eliciting levels of motivation leading to creative efforts. Additionally, we consider the mediating influence of trust in driving knowledge contribution behaviour. Our hypothesising suggests that trust in the hosting platform reduces uncertainty and fosters knowledge exchange. Based on an empirical study of Kaggle's data scientists community, it reveals that intrinsic motivation exerts a strong effect on participation intention, which in turn positively impacts participant's creative efforts. Highly autonomous competitions with special emphasis on problem solving that require solvers to perform a variety of tasks will further challenge contestants to apply their abilities and skills leading to greater enjoyment and sense of competence. Our findings provide important implications for Web platform managers for the successful management of crowdsourcing communities.

1. Introduction

Online innovation contests represent a new form of inbound open innovation (Huizingh, 2011) where individuals or institutions take an idea or solution seeking process, traditionally performed by internal employees, and outsource it to an undefined, generally large group of individuals, referred to as the 'crowd', using advanced collaborative technologies (Estellés-Arolas and Gonzalez-Ladron-De-Guerva, 2012, Saxton et al., 2013, Majchrzak and Malhotra, 2013). A growing body of literature has acknowledged the application of online communities for innovation, particularly with regard to exploration and ideation projects (Bayus, 2013, Morgan and Wang, 2010, Parmentier and Mangematin, 2014). These web-enabled systems gather ideas from a crowd of users with diverse skills sets, knowledge and expertise that organisations exploit for the development of novel ideas and solutions (Howe, 2006, Howe, 2008, Surowiecki, 2005). Recognising the capability of crowdsourcing for mobilising the creative efforts of large numbers of individuals, organisations such as IBM are using crowdsourcing to empower employees in collaborative innovation processes (Bjelland and Wood, 2008). Organisations benefit from the collective efforts of

individual intelligences and creative synergies that emerge from the interactions among a diverse group of individuals, which lead to higher quality exploratory outputs (Hargadon, 2003, Majchrzak et al., 2004). Further, by inviting a large number of solvers to participate, companies can complete the innovation tasks faster (Morgan and Wang, 2010). Crowdsourcing can help companies to quickly brainstorm new development opportunities that might fall outside the companies' operations and routines. This enables companies to shorten innovation life cycles and enhance corporate competitive advantage by increasing the speed to market of new products and services (Chesbrough, 2003). Crowdsourcing research further suggests that solving innovation tasks via crowdsourcing is cheaper than solving them internally (e.g., Howe, 2008). Although some compensation is required for rewarding solvers, Brabham (2008) study shows that the cost of crowdsourcing is lower than solving the tasks internally in most cases.

The business potential of crowdsourcing as a channel of innovation for companies has urged both management scholars and practitioners to consider how online communities can be sustained and nurtured to generate novel ideas and solutions (Poetz and Schreier, 2012). Crowdsourcing relies on a self-selection process among solvers willing and able to respond to the broadcast innovation contests (Lakhani et al., 2007). However, participants' time and attention have become increasingly scarce resources as the online space grows more crowded

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with more options for participants to choose from on where and how to spend their time (Wang et al., 2013). Yet, sustained participation is crucial; thus, understanding the specifics of participants' voluntary behaviour to share and create innovation knowledge is central to the design and maintenance of viable crowdsourcing communities (Chiu et al., 2006, Ardichvili et al., 2003).

This paper examines the effect of crowdsourcing competition design in motivation as determinant of participants' creativity in online communities. We draw from the motivation through job design theory (Hackman and Oldham, 1980) to develop and test a theoretical framework that explores the impact of task and knowledge design characteristics in a participation architecture that promotes creativity and innovation. Additionally, we consider the mediating influence of trust in the platform provider in driving knowledge contribution behaviour in knowledge communities. We carry out this investigation in the context of prediction competitions given their potential to address the increasing problems faced by companies in trying to deal with "Big Data" (Manyika et al., 2011). Crowdsourcing allows greater experimentation, enabling organisations to extract value from a gradually more turbulent, unstructured digital data environment (Boudreau and Lakhani, 2013, Garcia Martinez and Walton, 2014).

Our study contributes to community innovation research in two important ways. First, we respond to calls for a better understanding of the triggers of a compelling and enjoyable virtual co-creation experience and their positive effects on creativity (Prahalad and Ramaswamy, 2003, Nambisan and Nambisan, 2008). Crowdsourcing research demonstrates that competition design characteristics can ignite a sense of enthusiasm in participants and propel them to their peak levels of creativity (Huang et al., 2010). Hence, we aim to identify the task and knowledge properties that affect contributed effort in prediction competitions. Second, we expand knowledge in crowdsourcing communities by applying theories of trust to explain the emergence of trust in this environment and its importance to knowledge exchange. Departing from existing research on trust development among community members (Baruch and Lin, 2012, Antikainen et al., 2010), this paper looks at system trust and its mediating influence in cooperative knowledge exchange. Similarly to the selection of design attributes, trust in the hosting platform can influence knowledge sharing (Leimeister et al., 2005).

The paper proceeds as follows. Following the introduction, in Section 2 we draw from the relevant literature on psychology and job design to develop our theoretical model and research hypotheses. In a next step, we discuss our data and measures before empirically investigating the proposed relationships using a variance-based structural equation model (SEM) approach to simultaneously assess these proposed relationships. Finally, we discuss our results and present theoretical and practical implications, and a future research agenda, which takes into account the study's limitations.

2. Theoretical framework and hypotheses

2.1. Motivational competition design characteristics

Crowdsourcing research presents an extensive coverage of the motivational factors and reward schemes leveraging crowd creative potentials (Fuller, 2006, 2010, Frey et al., 2011, Roberts et al., 2006). In contrast, there is still a lack of studies that empirically analyse the competition design attributes that trigger creative efforts while providing participants with a virtual co-creation experience that would attract them to the crowdsourcing platform in the future (Piller and Walcher, 2006). Jobs possess certain characteristics that have psychological implications on individuals' willingness to personally engage in work roles (Foss et al., 2009). Hackman and Lawler (1971) argued that a substantial portion of the variation in worker performance (i.e., internal motivation) could be explained by the characteristics or specific attributes constituting the job and how workers perceived these attributes.

Drawing from motivation through job design theory (Hackman and Oldham, 1980), we consider motivational job characteristics with the potential to elicit motivation in virtual communities. The premise of the motivational approach is that crowdsourcing competitions will be more motivating and satisfying if high levels of tasks and knowledge characteristics are present (Morgeson and Humphrey, 2006). To the extent that participants perceive that these competition design characteristics offer clear and desired benefits for their personal investment, they ought to exhibit an increasing willingness to fully engage in crowdsourcing competitions. In addition to job characteristics that reflect the task, in this paper we also consider knowledge requirements of work (Campion and Mcclelland, 1993), considered in the creativity literature as critical for creativity (Amabile et al., 1996). Distinguishing between task and knowledge characteristics acknowledge the fact that crowdsourcing competitions can be designed or redesigned to increase task demands, knowledge demands or both to enhance the crowdsourcing experience (Campion and Mcclelland, 1993). We specifically focus on the impact of two crowdsourcing task dimensions: autonomy and task variety, and three knowledge dimensions: complexity, problem solving and specialisation.

2.1.1. Crowdsourcing task dimensions

Task autonomy is a central work characteristic in motivational work design approaches (Campion, 1988, Hackman and Oldham, 1976). Autonomy refers to the degree of freedom that is allowed to the worker during task execution (Hackman and Oldham, 1980). If more own decisions and creativity are permitted, the worker's motivation will increase (Fuller, 2010, Hackman and Oldham, 1980, Morgeson and Humphrey, 2006). In the context of crowdsourcing communities, if a competition task is not specifically dependent on the sponsor's other jobs and/or business processes, the competition itself has a higher level of autonomy, which in turn offers the solver a higher level of control over his/her actions during the competition (Zheng et al., 2011). If an individual has a high level of control over his/her behaviour, a higher level of intrinsic motivation might emerge. Predictive modelling competitions offer solvers autonomy to highly elaborate in terms of their chosen methodologies, contributing to the creation of scientific insight (Bentzien et al., 2013). We therefore hypothesise that:

H1. Competition autonomy is positively associated with intrinsic motivation.

Task variety refers to 'the degree to which a job requires employees to perform a wide range of tasks on the job' (Morgeson and Humphrey, 2006, p.1323). Jobs that involve the performance of different work activities are likely to be more interesting and enjoyable to undertake (Sims et al., 1976). Thus, a higher level of task variety is likely to encourage solvers to develop solutions from different perspectives (Howe, 2008). If predictive modelling competitions require data scientists to perform different tasks, players might feel more intellectually challenged in applying their analytical abilities and skills to develop novel solutions. Players might also experience increased enjoyment in developing a code or algorithm to the competition. Hence, we hypothesise:

H2. Task variety is positively associated with intrinsic motivation.

2.1.2. Crowdsourcing knowledge dimensions

Task complexity refers to 'the extent to which the tasks on a job are complex and difficult to perform' (Morgeson and Humphrey, 2006, p. 1323). The literature suggests a curvilinear relationship between complexity and intrinsic motivation (Wood, 1986). Initially, complexity might have a positive impact on intrinsic motivation because an increasing level of complexity leads to increasing levels of challenge and activation (Morgeson and Humphrey, 2006). When a task is more complex, completing the task can reflect a higher competence; hence it is