

# Inventing Together: The Role of Actor Goals and Platform Affordances in Open Innovation

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## Abstract

With the ubiquity of the internet and social media platforms, open innovation (OI) opportunities now extend to individuals with creative ideas and interests in innovation. Understanding why individuals are willing to engage in open innovation and how their diverse goals affect their participation is important for assessing the viability of various OI models and to inform platform design. In this paper, we develop a theoretical model that examines the impact of three categories of human goals—*extrinsic*, *intrinsic*, and *internalized extrinsic*—on actors' continuous intentions to participate in three general categories of open innovation behaviors: *ideation*, *collaboration*, and *socialization*. The model also considers how perceived platform participation affordances mediate the influence of goals on these innovation behaviors. We validate this goals-affordances-behavior model via a field survey of participants on a social product development (SPD) platform. By theorizing and empirically examining how goals influence participation in the SPD context, our study advances knowledge about open innovation behaviors, provides a foundation for future research across various OI models, and highlights practical insights for OI platform design.

**Keywords:** Open Innovation, Social Product Development, Ideation, Collaboration, Socialization, Goals, Perceived Participation Affordances, Behavioral Intention, Innovation Platform

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*Marisa has a million ideas but only a few minutes to spare. She had an idea for a brand-new product her kids would love, so—naturally—she shared it on the Quirky invention platform. Talented renderers, sketchers, and toy enthusiasts in our community helped strengthen her idea submission. In turn, she shared some of her Influence (i.e., a cut of the product revenue) with the people that helped out the most.*

—Quirky.com

## 1 Introduction and Motivation

The term open innovation (OI) commonly refers to an array of business models that rely on creative resources external to a firm that join in and contribute to new

product or service development. With the growth of the internet and social technologies, OI opportunities now extend beyond large firms and their organizational customers to include individuals with creative ideas and an interest in innovation (Leenders & Dolfsma, 2016; Muninger et al., 2019; Roberts & Piller, 2016; Urbinati et al., 2020). OI platforms such as InnoCentive, NineSigma and IdeaScale thus build on the long-held promises of democratizing and energizing OI (Acar, 2019; Bogers et al., 2017) by attracting, channeling, and maintaining the creativity of diverse individuals.

Despite the general appeal of OI business models, a number of OI platforms have struggled to sustain the interest of individuals in their communities and to

move beyond their initial successes and become economically viable enterprises (Bogers et al., 2018; Kohler & Nickel, 2017; Majchrzak et al., 2020). OI typically draws on collaborative as well as competitive interests, on individual incentives for creativity, and on individuals' community engagement and altruistic support (Boudreau & Lakhani, 2009; Füller et al., 2014). Individuals thus bring a variety of goals to OI communities that motivate their behavior on OI platforms (von Krogh et al., 2012); however, these goals may not be harmonious among community members or aligned with the platform sponsor's intentions (Abhari et al., 2019; Füller et al., 2014; Liao & Xu, 2020). OI platform sponsors are then challenged to balance their appeal across competitive, collaborative, and social goals to attract individuals with high-quality, creative ideas while also engaging participants in refining others' ideas and building the innovation community (Füller et al., 2014; Nambisan et al., 2018; West, 2020).

Understanding how participants' goals influence their innovation behaviors toward engagement in innovative activities is important for OI sponsors seeking to realize the full potential of OI (Bogers et al., 2017; Kohler & Chesbrough, 2020; Randhawa et al., 2016). This is particularly important for OI platforms designed to engage external actors broadly in innovation processes or activities that rely on varied goal-oriented behaviors (Bogers et al., 2017; Kohler & Chesbrough, 2020). Previous studies have articulated the general logic of OI, described the workings of some well-known networks, and examined the benefits of engaging external actors in new product development (Hossain et al., 2016; Randhawa et al., 2016). However, these studies have not examined closely or fully the goals of individual innovators who participate in OI platforms or how their diverse goals influence different types of innovation behaviors (Randhawa et al., 2016). Studies of open source communities and virtual customer communities provide some insights into individuals' goals relevant to OI (e.g. Füller, 2006; Nambisan & Baron, 2009; von Krogh et al., 2012), but these and other OI business models differ substantively in innovation focus, incentives, activities, community structure, and governance. Thus, their empirical findings cannot be generalized across OI contexts without further study and theoretical abstraction (cf. Lee & Baskerville, 2003).

In this paper, we develop and test a goals-affordances-behavior model that renders the influence of actors' goals on their innovation behaviors on an OI platform. Our model advances the understanding of technology affordances for OI (cf. Nambisan et al., 2017) by theorizing the mediating influence of perceived participation affordances in goals-behavior relationships. The context of our study is social product development (SPD) (Abhari et al., 2020;

Annosi et al., 2020). SPD is an OI model that draws on individual *actors* with diverse goals and behaviors that engage in the spectrum of innovation activities from early ideation to product development on digital platforms employing social mechanisms to build participation (Forbes et al., in press; Han & Yang, in press). Understanding the diversity of actors is critical to portraying a holistic picture of OI participation (Forbes et al., in press). SPD, with its mix of actor goals and participation opportunities (Coelho et al., 2016), thus offers such a rich context for our study.

The remainder of this paper is organized as follows. First, we consider the general dimensions of IO participation behaviors and how they manifest in the SPD context. We then develop our research model to explain how actor goals and SPD participation affordances influence actors' participation in these innovation activities. Next, we describe our empirical study methods to assess the research model and present the results of a survey of SPD participants. We conclude with the implications of our study and opportunities for future research.

## 2 Research Background: Open Innovation Behaviors

A variety of business models have developed from the basic tenets of OI (Bogers et al., 2018; Hjalmarsson et al., 2017). Open source communities are a commonly studied model in the information systems (IS) field (Germonprez et al., 2020; Liao & Xu, 2020; Yeliz Eseryel et al., 2020). Other well-known models include crowdsourcing (cf. Jian et al., 2019), innovation marketplaces and idea contests (cf. Camacho et al., 2019), and user innovation and virtual customer environments/communities (cf. Ma et al. 2019). Social product development (SPD) is an emerging OI model that presents a diverse array of OI activities and processes, from proposing new concepts to fully developing solutions (Abhari et al., 2020; Annosi et al., 2020). Activities are open broadly to individuals interested in innovation, and most interactions among participants are mediated by social networking-like platforms.

OI models differ from one another in terms of the business model and goals, community incentives for participation, and community governance. However, a review of actor activities on a variety of OI platforms suggests that these platforms engage individuals in three general categories of innovation behaviors: *ideation*, *collaboration*, and *socialization* (Abhari et al., 2020; Annosi et al., 2020). Each of these dimensions have been cited in the OI literature to explore actor behavior (Bhimani et al., 2019; Dingler & Enkel, 2016; Gama, 2019; Gloor, 2006; Hofman et al., 2017; Kohler & Nickel, 2017). *Ideation* behaviors entail identifying innovation opportunities and

providing solutions such as new products or services (Schemmann et al., 2016). *Collaboration* behaviors involve cooperation or partnership between actors to find or improve solutions, where the extent of collaboration depends on the complexity of requirements and the expected quality of solutions (Taran et al., 2015). *Socialization* behaviors concern actors' relationships with each other, within and beyond specific innovation tasks, which build and sustain the innovation community (Dingler & Enkel, 2016).

Together, these categories suggest a conceptual framework of OI behaviors sufficiently general to apply across individual-level OI models (cf. Johns, 2017). Appendix A compares notable OI models along these and other dimensions. Appendix B presents an overview of SPD innovation processes, based on our in-depth study of SPD platforms (Abhari et al., 2020) as well as other researchers' descriptions of SPD business logic (Allen et al. 2018; Annosi et al., 2020; Forbes et al., in press). In what follows, we highlight how ideation, collaboration, and socialization behaviors are manifested in OI processes and activities, focusing on our study context (SPD).

## 2.1 Ideation on OI platforms

Ideation is the most common behavior that can be observed across OI platforms and includes processes for submitting new ideas (Gama, 2019; Schreier et al., 2012). OI sponsors are typically designated the "problem owner" who invites external actors to contribute to predefined problems or specific innovation tasks. Financial rewards motivate ideation in innovation marketplaces and idea contests (cf. Camacho et al., 2019), whereas in other OI models, members' motivation to ideate depends in part on community members' dedication to the community's goals, e.g., in open source communities (Germonprez et al., 2020), or their identification with a brand, e.g., in virtual customer environments (Hsieh & Chang, 2016; Schlagwein & Bjørn-Andersen, 2014).

In the SPD context, innovation sponsors do not specify the problems or opportunities within their designated market domain, i.e., consumer products (Peterson & Schaefer, 2014). Instead, SPD actors initiate innovation projects by proposing new product concepts, which the community and the SPD platform owner then screen (Annosi et al., 2020). Ideation is a competitive activity, as only a few ideas are selected for development (Kornish & Ulrich, 2014). After the product launch, the names of lead ideators may be added to the product portfolio and package, recognized within the community by the sponsor (e.g., via success stories), and acknowledged by other community members, thus contributing to the ideators' reputations. As such, the SPD model places actors at the heart of ideation (Abhari et al., 2020). Since

successful ideators may share profits from product sales or licensing with the innovation sponsor, it is the most financially rewarding activity in SPD (Annosi et al., 2020).

## 2.2 Collaboration on OI platforms

OI requires some degree of collaborative effort to move a new idea through the innovation process. For example, in ideation competitions, collaboration may be established between the ideator(s) and the competition sponsors (Liao & Xu, 2020). OI models may also extend ideation activities beyond new idea submission to involve the lead ideator with community participants in the further development of a new idea (Stanko, 2016). On some OI platforms, the community collaboratively selects and then develops and refines new product ideas (Schreier et al., 2012). These engagement processes can support ideators in the development or refinement of their initial ideas (Camacho et al., 2019; Piller & Ihl, 2013). When OI platforms allow for both ideation and collaboration activities, the processes and incentives for these behaviors are typically distinct.

SPD platforms engage actors systematically in a broad range of collaboration activities from product development to commercialization (D. Wu et al., 2016). Collaboration activities can be as simple as voting to advance a new product idea or as complex and as multilayered as working on product feature development. This diversity helps engage actors interested in or experienced with different innovation processes, while the openness of collaborative activities allows actors to participate in various types of projects (Han & Yang, in press). SPD actors can also invite other actors to help with tasks such as the rendering or specification of a new product concept. Some collaborative activities (e.g., voting) require little to no specific experience or skills, allowing a broad array of community members to participate in collaborative activities for fun or personal satisfaction (Kornish & Ulrich, 2014). Unlike ideation, only a few collaborative activities allow the SPD actors involved to earn financial rewards (Abhari et al., 2020).

## 2.3 Socialization on OI platforms

Individuals engage in socialization behaviors on OI platforms because they enjoy being part of the community and networking with other creative individuals. Socialization supports and may even precede ideation and collaboration by helping members learn about and become part of the community (Carillo et al., 2017; Dingler & Enkel, 2016). For example, creating profiles and sharing project portfolios helps individuals display their qualifications and experiences and facilitates actor-to-actor networking by helping them connect with like-minded members. On many OI platforms, actors use

social features to build profiles, connect with other members (by “following” or messaging them), ask questions, share experiences, communicate for the purpose of “teaming up,” and explore opportunities to network and to learn from others (Corral de Zubielqui et al., 2019).

SPD platforms rely on social mechanisms to build a community with shared interests, professional relationships, and trust among its members (West, 2020). Bringing people from different disciplines and backgrounds into an SPD community and facilitating their socialization and experiential communication are essential to the innovation process (Abhari & Davidson, 2016; Annosi et al., 2020; Carillo et al., 2017; Coelho et al., 2016; Muninger et al., 2019). Socializing behaviors are distinct from but also supportive of project-focused ideation and collaboration in SPD since they allow actors to learn and experiment within the community by exchanging information and networking with other professionals with shared interests (Abhari et al., 2020; Annosi et al., 2020). SPD actors can also anticipate, request, and evaluate other actors’ competencies and contributions through social interactions, rather than only via experiences on particular innovation projects (Annosi et al., 2020; R. D. Evans et al., 2018). Socializing behaviors may contribute to the SPD platform’s success by engaging actors in knowledge sharing (Bhimani et al., 2019; Kornish & Ulrich, 2014) even though actors do not earn specific rewards from participating in social activities and some may simply join discussions or observe activities.

### 3 Theoretical Foundations and Hypothesis Development

In this paper, we develop a research model to investigate how actors’ goals influence their behavioral intention to contribute to OI in the SPD context. Our research model brings together self-determination theory with technology affordance theory to identify the main goals that drive actors’ OI behaviors and to explicate how actors’ perceptions of possible means for ideation, collaboration, and socialization (participation affordances) affect their subsequent behavior and thus mediate the influence of goals on OI behaviors. We conceptualize *innovation behaviors* in the SPD context in terms of actors’ continuous intentions to participate in the three categories of behavioral activities outlined above (ideation, collaboration, and socialization), in line with the implementation intention perspective (Gollwitzer, 1999). An implementation intention is a self-regulatory strategy in the form of an “if-then” plan that specifies the when, where, and how portions of goal-directed behavior (Gollwitzer & Brandstatter, 2008; Moors et al., 2017). Accordingly, we view the intention to ideate, collaborate, and socialize as the

means (i.e., the implementation intention) to fulfill the relevant ideation, collaboration, and socialization goals of the actor (cf. Brandstatter et al., 2001). We also account for how actors’ behavioral intentions can be actualized through the technological features of the SPD platform, given that implementation intentions are driven by actors’ perceptions of opportunities to perform the behavior (Pavlou & Fyngenson, 2006).

#### 3.1 Goals and OI Behaviors in SPD

Appealing to goals that are relevant to participants is critical to attracting and sustaining actor engagement in online communities such as OI platforms (Acar, 2019; Kohler & Nickel, 2017). Goals indicate what actors are trying to accomplish by participating in community activities and can help explain their OI behaviors (Khansa et al., 2015). OI contexts such as SPD encourage participation in a wide array of innovation activities and thus draw on the spectrum of innovation behaviors through which participants may satisfy their varied goals (Füller et al., 2014).

Effectively appealing to, incentivizing, and facilitating actors’ goal attainment through an OI business model and platform can be problematic. Actors’ goals may be in conflict with each other or may otherwise not align well with the OI sponsor’s intended business model (Füller et al., 2014). For instance, Liao and Xu (2020) highlight how appealing to software developers’ financial goals through ideation competitions conflicted with some of the participants’ goals for collaborative open source software development, alienating some contributors. Füller et al. (2014) identified six groups of OI actors—*master*, *idea generator*, *efficient contributor*, *socializer*, *passive commentator*, and *passive idea generator*—who differed in their goals and thus in their OI behaviors and the quality of their submissions. Prior studies have also recognized conflicting OI behaviors when participation is driven by both pecuniary and nonpecuniary motivations (Abhari et al., 2019; West, 2020). These studies suggest that the necessary first steps to inform an OI business model and platform design are to examine how actor goals influence their various innovation behaviors; to assess possible (mis)alignment of actor goals, incentives, and desired business OI outcomes; and to adjust business rules, processes, and platform design accordingly.

The influences of individuals’ goals on their behavioral intentions and their actual behavior have been extensively explored and well established in psychological and sociocognitive literatures (e.g. Conner & Armitage, 1998; Gollwitzer & Sheeran, 2008; Ostlund & Balleine, 2010). Goal theories, such as goal content theory (Austin & Vancouver, 2005), goal achievement theory (Harackiewicz, 2002), goal-directed behavior theory (Aarts & Elliot, 2012), goal-orientation theory (Nicholls, 1984), self-determination



theory (Deci & Ryan, 1985, 2000), and goal-setting theory (Locke & Latham, 2002), all provide theoretical foundations to help explain why and how actors contribute to OI initiatives through their innovation behaviors.

Self-determination theory (Deci & Ryan, 1980) has been widely applied to examine the motivations of software developers in open source communities (von Krogh et al., 2012). In self-determination theory, goals are often categorized into two higher-order categories: extrinsic and intrinsic (Sebire et al., 2009; Vansteenkiste et al., 2006). Extrinsic goals refer primarily to external stimuli relevant to the goal context (e.g., gaining financial rewards), whereas intrinsic goals reflect the actors' personal values. However, individuals may internalize some extrinsic goals because of their personal significance (Acar, 2019; Vansteenkiste et al., 2006); thus, "internalized extrinsic" goals have external value but are also internalized because they are more autonomous (having personal significance) than controlled (having external significance) (Deci & Ryan, 1985; Mack & Landau, 2020; Vansteenkiste et al., 2006). Internally regulated goals do not fully depend on an external contingency to drive a particular behavior.

In this study, we adopt the higher-order categories of *extrinsic*, *intrinsic*, and *internalized extrinsic* from extant self-determination theory literature and earlier research on open source development (Mack & Landau, 2020; von Krogh et al., 2012). These goal categories can be further contextualized to investigate OI (and SPD) behaviors. Self-determination theory highlights various types of aspirations (goals) that actors may be pursuing, such as financial wealth, recognition or fame, an attractive image, personal development, meaningful relationships, community contributions, and psychophysical fitness (Deci et al., 2017). Appendix C provides a summary of goal types examined in the IS literature relevant to OI behaviors. Monetary gain and recognition (extrinsic goals); learning and entrepreneurship (internalized extrinsic goals); and enjoyment, altruism, and socialization (intrinsic goals) are key actor goals in the SPD context.

### 3.2 Perceived Participation Affordances and OI Behaviors in SPD

Research on goal-directed behavior demonstrates that having a goal is just the first step toward goal attainment, since implementational problems need to be solved successfully to achieve a goal through actions taken (Gollwitzer & Brandstatter, 2008; Pavlou & Fygenson, 2006). Goal theory posits that "goals direct attention and effort toward goal-relevant activities and away from goal-irrelevant activities. This effect occurs both cognitively and behaviorally" (Locke & Latham, 2002, p. 706). In computer-

mediated environments such as SPD platforms, goal-oriented action requires the actor to perceive the features of the platform that enable that action (Khansa et al., 2015; Nagy & Neff, 2015) and then to act through these features to pursue their goals on the platform. Goal-directed actors are more likely to look for opportunities for actions that are consistent with their goals (Locke & Latham, 2002) and to process implementation possibilities selectively according to their goals (Guinote, 2007, 2008).

In this study, we draw on the concept of *technology affordances* to theorize the relationships between actor goals, their perception of participation possibilities that are enabled by OI platform technology, and innovation behaviors. Markus and Silver (2008) define technology affordances as "the possibilities for goal-oriented action afforded to specified user groups by technical objects" (p. 622). In IS research, the affordance concept has been used to conceptually address the myriad possibilities for action that technology features enable to different users (Fayard & Weeks, 2014; Grgecic et al., 2015; Karahanna et al., 2018; Majchrzak et al., 2013; Strong et al., 2014). Technology affordance is thus a relational concept arising from the varied possibilities for goal-directed action that a technological artifact provides to specific actors through its features and capabilities (Anderson & Robey, 2017; Majchrzak et al., 2013; Volkoff & Strong, 2013). Moreover, S. K. Evans et al. (2017) argues that affordances are not binary but have *gradations* in the degree of action that is afforded, while Anderson & Robey (2017) also suggest that the potency or strength of an affordance varies with users, tasks, and context.

Hence, we argue that an actor's goal-directed behavior enacted through an OI platform depends in part on how the actor's goals influence her perception of the platform's affordances (cf. Cañal-Bruland & van der Kamp, 2009; Jankowiak, 2017; Lawler III, 1973). If affordances intended by designers (i.e., features that enable participation in the platform's IO activities) correspond to an actor's situated goals, the actor is more likely to notice and to act on those affordances (Locke & Latham, 2002; Stoffregen, 2004). Since affordances present the actor with possible means to accomplish goal-oriented actions, the stronger an actor's goals are to undertake an action, the more likely the actor is to attend to or notice (perceive) relevant affordances in the environment and to assess the extent to which the perceived affordance might (or might not) implement the actor's goals through the actions afforded (Brandstatter et al., 2001; Gollwitzer & Brandstatter, 2008; Moors et al., 2017). An actor who is not highly motivated to undertake an afforded action is less likely to attend to (perceive) the affordances present in the environment to do so (Downes et al., 2017).

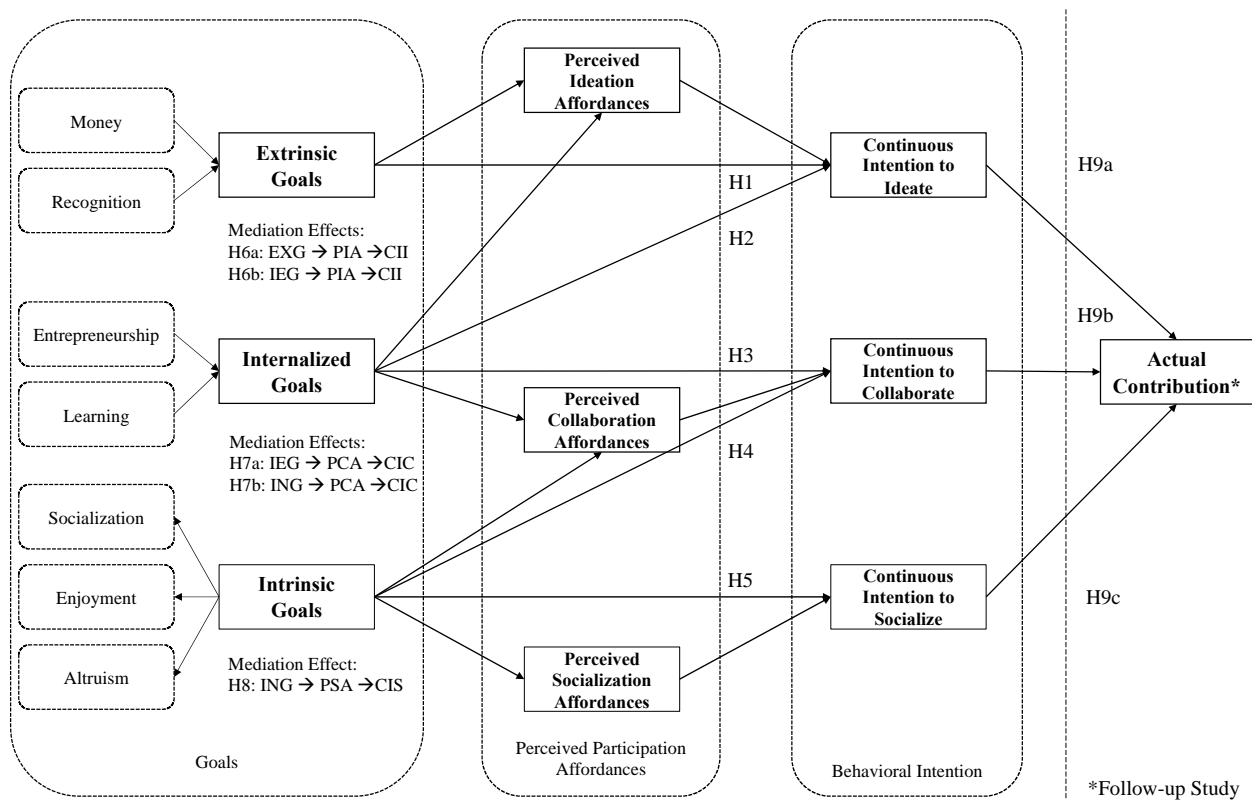


Figure 1. Goals-Affordances-Behavior Model

### 3.3 Hypotheses

Given these theoretical bases in the affordance and goal theory literatures, we argue that an actor’s goals influence perceptions of SPD participation affordances, which present the actor with a means to realize goals (implementation possibility); further, the resulting implementation intention may then increase the actor’s propensity to take the afforded SPD actions in order to fulfill goals. Accordingly, we posit a series of hypotheses that explain the direct relationships between goals and OI behavior plus the mediating roles of perceived participation affordances in SPD. Figure 1 depicts this research model, which we develop in the following sections.

#### 3.3.1 Goals and Ideation in SPD

Ideation entails the submission of new ideas (Schemmann et al., 2016). SPD platforms invite any community member to submit new product ideas for consideration by the innovation community, and the platform depends on members’ active participation in ideation to initiate innovation projects (Annosi et al., 2020). SPD actors have the freedom to propose new ideas; if successful, they can receive rewards and recognition (Coelho et al., 2016). Financial rewards can play a significant role in driving ideation on SPD platforms, since they foster the perception of fairness

and exchanged-based justice (Fernandes & Remelhe, 2016). For example, the SPD platform Quirky shares revenue from products that move to market with the community members who contributed the idea; the prospects of earning revenue from their inventive ideas are a major attraction for some community members (Abhari et al., 2020).

Opportunities to achieve recognition are also strong motivations for ideation (Acar, 2019). Successful ideation can lead to public, community, and peer recognition, as well as enhance professional reputation and eventually increase the actor’s labor market value (von Krogh et al., 2012). In SPD, the platform owner can heighten this potential outcome by recognizing and publicizing community members for successful ideation. For instance, platform owners can rank ideators or add their names to product profiles and packaging. Through ideation activities, SPD actors can thus pursue recognition goals to establish standing as designers or inventors.

Therefore, we posit that monetary compensation and formal recognition goals individually and jointly stimulate ideation behaviors in SPD. Self-determination theory classifies wealth and fame as extrinsic goals because they are focused on obtaining external rewards (external regulation), such as financial rewards, positive evaluations from others, or other external manifestations of worth (Deci & Ryan,

2000). From this perspective, extrinsic goals are the reasons (controlled motive) actors engage in SPD ideation activities to potentially gain external rewards such as financial success and receiving recognition. Thus, we posit:

**H1:** Extrinsic goals positively influence continuous intentions to ideate.

Prior research has validated the relationship between the desire to learn new skills and the intention to ideate (Acar, 2019; Fernandes & Remelhe, 2016; Mack & Landau, 2020). Submitting new product ideas allows SPD community members to try out new ideas, to get feedback on their market value, and to learn about the process of developing new products. Additionally, SPD platforms stimulate entrepreneurship by providing possibilities to acquire information about potential market solutions and helping commercialize innovation (Battistella & Nonino, 2012).

These professional development goals (i.e., learning and entrepreneurship) can be classified as internalized extrinsic goals (Deci et al., 2017) that can be fulfilled through ideation activities (Mack & Landau, 2020; Ståhlbröst & Bergvall-Kåreborn, 2011; von Krogh et al., 2012). Personal development such as learning through ideation allows actors to partially or fully internalize the initially external regulation of behavior because of the personal significance of the outcomes (Vansteenkiste et al., 2006). If actors are supported in learning from their ideation successes or failures or are self-endorsed by them, they are more likely to persist in their attempts (Camacho et al., 2019) and develop an inherent interest in ideation, presumably because their needs for competence and self-acceptance (attractive self-image) can be satisfied (Deci & Ryan, 1980). We expect that both learning and entrepreneurship goals act as internalized extrinsic goals that are positively related to an actor's continuous intention to ideate on SPD platforms. Therefore, we hypothesize:

**H2:** Internalized extrinsic goals positively influence continuous intentions to ideate.

### 3.3.2 Goals and Collaboration in SPD

Active collaboration among actors to address innovation challenges and to find or improve solutions is a core premise of OI (Füller et al., 2014). SPD platforms are designed to enable systematic collaboration among community members (Annosi et al., 2020), such as refining ideas, developing technical solutions, evaluating prototypes, and critically assessing product features and design (R. D. Evans et al., 2018) and may even extend to participating in activities such as market research on certain SPD platforms (Annosi et al., 2020; Kohler & Nickel, 2017).

Pursuing extrinsic goals through collaborative SPD activities is less compelling since external rewards are primarily associated with ideation. Instead, collaborative behaviors are typically motivated by goals with some degree of internalization, such as learning (Mack & Landau, 2020). Perceived cognitive benefits, such as competence building, develop through pursuing internalized extrinsic goals in OI activities (Verleye, 2015). Learning goals such as personal or professional development are important motivators for collaboration in OI communities generally (Acar, 2019; von Krogh et al., 2012). On SPD platforms, community members can acquire new knowledge, enhance competencies, and gain firsthand experience by working collaboratively on innovation projects initiated by others. Entrepreneurial goals can also be realized by sharing knowledge collaboratively (Nambisan et al., 2018), for instance in SPD, by contributing to community efforts to improve products or bring new products to the market. Therefore, we posit:

**H3:** Internalized extrinsic goals positively influence continuous intentions to collaborate.

Self-determination theory distinguishes the role of intrinsic goals from extrinsic and internalized goals (Vansteenkiste et al., 2006). Intrinsic goals motivate actors to engage in an activity for its own sake and are associated with high involvement and interaction behaviors such as collaboration (Deci et al., 2017). Socialization, altruism, and enjoyment are identified as intrinsic goals (Acar, 2019; Mack & Landau, 2020; von Krogh et al., 2012), which are primarily process-related and can be achieved through the enjoyment of the task or through obligation-based satisfaction by meeting morals and values (Li et al., 2012; von Krogh et al., 2012).

SPD community members may seek enjoyment by participating in collaborative innovation activities such as finding solutions to problems and helping others in the process of problem-solving (Acar, 2019; Füller, 2010). They may also perceive excitement and fun by interacting with like-minded people in a highly creative environment (Fernandes & Remelhe, 2016). Socialization and networking are intrinsic goals that help maintain actor participation (Acar, 2019; Dingler & Enkel, 2016) by establishing collaborations in common fields of interest and developing professional relationships (Mack & Landau, 2020). Altruism is another facet of intrinsic goals evident in OI activities (von Krogh et al., 2012). For instance, altruism based on belief in the community's goals is important for collaboration in open software communities (von Krogh et al., 2012). In SPD, collaborative activities such as voting for a product's name are altruistic, as such activities benefit the community as a whole but the actor cannot expect explicit individual utility from contributing (Füller et al., 2014). Thus, we posit that

intrinsic goals can motivate actors to collaborate on SPD platforms even without (or with limited) external rewards:

**H4:** Intrinsic goals positively influence continuous intentions to collaborate.

### 3.3.3 Goals and Socialization in SPD

Socially oriented actors may join SPD platforms in order to experience inherent satisfaction by interacting with others in the community to establish a common field of interest and to develop professional friendships and relationships (Fernandes & Remelhe, 2016; Füller et al., 2014; Mack & Landau, 2020). Social exchanges are the first steps toward establishing subsequent working relationships with other actors (Peterson & Schaefer, 2014)—for instance, by assessing other actors' competency, ideas, and knowledge before engaging in any collaboration (Bstieler & Hemmert, 2015). Furthermore, actors may find the process of socialization with other like-minded individuals fun, enjoyable, and fulfilling (Salehan et al., 2017). Actors who find the process of helping others enjoyable may also show a higher intention to socialize through knowledge sharing (Zhao et al., 2016). Thus, intrinsic goals such as socialization, enjoyment, and altruism are particularly applicable to SPD platforms, and these intrinsic goals can be realized by participating in socialization behaviors (Acar, 2019; Fernandes & Remelhe, 2016). Therefore, we propose:

**H5:** Intrinsic goals positively influence continuous intentions to socialize.

### 3.3.4 The Mediating Role of Perceived Participation Affordances

SPD platforms provide a variety of features that present participation affordances to OI actors. Typically, ideation behaviors are afforded through features such as online idea submission, revision, and resubmission forms, and idea development or visualization tools (Hossain & Islam, 2015; Muninger et al., 2019). Collaboration behaviors generally rely on platform features such as evaluation and ranking forms, product improvement tools, and social survey tools (R. D. Evans et al., 2015; Muninger et al., 2019). Socialization behaviors are enabled by features like profile creation and management pages, following other actors, and peer-to-peer and group messaging (Abhari et al., 2020). Some platform features enable actors' behaviors beyond the initial intentions of the platform designers, while platform actors may ignore or underutilize other features (Karahanna et al., 2018).

Prior research has persuasively argued for the direct influence of affordances on actors' engagement with social platforms (Majchrzak et al., 2013; Sutcliffe et al., 2011; Treem & Leonardi, 2012). However, this assumes that the actor perceives the affordances since an artifact cannot exist as a stimulus for intentional actions unless it

is first received as a perceptual phenomenon (Ayer, 1972; Barkin, 2003). Moreover, an actor looks for and attends to action possibilities consistent with their goals (Guinote, 2007, 2008; Locke & Latham, 2002). The perceived affordances thus present the actor with possible ways to realize goals by taking the afforded actions (Lu & Cheng, 2012). When perceiving the possibilities for action brings into focus an implementation intention to achieve an actor's goals, it may heighten the actor's intention to take an afforded action (Gollwitzer & Brandstatter, 2008). We theorize this as the mediating influence of actors' perceived participation affordances on goal-behavior relationships (Kaptelinin et al., 2012) following the logic of Hypotheses 1-5.

First, extrinsic goals (money and recognition) are most directly related to ideation activities in SPD. We expect that the stronger an actor's extrinsic goals, the more likely the actor attends to opportunities afforded to participate in ideation activities on the SPD platform; the stronger the perception of these ideation affordances, the more likely the actor is to develop the behavioral intention to engage in ideation. For instance, an SPD actor whose primary goal is to earn financial rewards will likely focus on possible ideation actions and will thus likely attend to (perceive) ideation affordances in features such as submission, revision, and resubmission forms and visualization tools as the means to submit new ideas (ideate). Therefore, we hypothesize:

**H6a:** Perceived ideation affordances mediate the relationship between extrinsic goals and continuous intentions to ideate.

Via ideation activities on SPD platforms, actors can also learn about new product development processes, assess their own competencies, evaluate their own new business ideas in a low-risk environment, and gain insight into entrepreneurship processes. Actors with internalized extrinsic goals such as learning and entrepreneurship are more likely to perceive ideation affordances and actualize these affordances to submit new ideas for personal or professional development purposes. We expect that the stronger an actor's internalized extrinsic goals, the more likely the actor is to search for and attend to opportunities afforded to participate in ideation activities on the SPD platform and thus the more likely the actor is to develop the behavioral intention to engage in ideation. Therefore, we propose:

**H6b:** Perceived ideation affordances mediate the relationship between internalized extrinsic goals and continuous intentions to ideate.

SPD actors can also fulfill their internalized extrinsic goals for learning and entrepreneurship by participating in collaboration activities when they take advantage of platform features to contribute to collaboration activities for products undergoing development. We argue that internalized extrinsic goals will render the possibilities to collaborate more salient to actors and consequently



trigger a higher intention to engage in collaboration with other actors. Hence, we expect that the stronger an actor's internalized extrinsic goals, the more likely the actor is to attend to opportunities afforded to participate in collaboration activities on the SPD platform and thus seek to actualize these afforded collaborative actions. Therefore, we posit:

**H7a:** Perceived collaboration affordances mediate the relationship between internalized extrinsic goals and continuous intentions to collaborate.

Collaboration behaviors on SPD platforms can satisfy intrinsic goals such that SPD actors with intrinsic goals (i.e., socialization, enjoyment, or altruism) will be more likely to perceive possibilities to collaborate and will be more willing to actualize possibilities to collaborate with others on the platform. The stronger an actor's intrinsic goals, the more likely the actor is to attend to afforded opportunities to engage in collaboration behaviors on the SPD platform and to take these collaborative actions. Therefore, we hypothesize:

**H7b:** Perceived collaboration affordances mediate the relationship between intrinsic goals and continuous intention to collaborate.

Like other online communities, SPD platforms offer opportunities for spending time with like-minded people who are not only enjoyable but also facilitate networking and altruistic actions to further community development. Actors with intrinsic goals are more likely to attend to and perceive platform features that enable or support socialization, and consequently are more likely to utilize these features to socialize with other community members. Therefore, we propose:

**H8:** Perceived socialization affordances mediate the relationship between intrinsic goals and continuous intentions to socialize.

### 3.3.5 Intention to Contribute & Actual Contribution in SPD

In this study, *actual contribution* refers to measurable individual actions to generate new product ideas and to work with others to improve these ideas. These actions have direct implications for the effectiveness of an SPD platform, which depends on members to submit and improve new product ideas (Camacho et al., 2019; Füller et al., 2014). The relationship between intention and behavior has been extensively validated in prior technology acceptance literature (Venkatesh et al., 2003). Accordingly, we expect that actors' continuous intentions to ideate, collaborate, and socialize predict individuals' actual contributions. Therefore, we posit:

**H9:** Continuous intentions to ideate (H9a), collaborate (H9b), and socialize (H9c) positively influence actual contributions.

## 4 Study Design and Methods

To validate our research model, we conducted a field survey to gather data on actors' goals for participating in SPD, perception of participation affordances, continuous intentions to contribute, and actual contributions on an SPD platform. The survey was administrated at two points in time, a month apart, to test the relationship between the continuous intention to contribute and actual contribution. We used the partial least squares (PLS) modeling technique to assess the measurement model and structural model (Hair Jr. et al., 2013).

### 4.1 Research Setting

Launched in 2009, Quirky (quirky.com) is one of the first companies to implement the SPD open innovation model on a social media platform (Coelho et al., 2016; Kornish & Ulrich, 2014; Piller et al., 2012). Quirky provided an ideal setting for our study, as we were interested in an SPD platform that offers diverse ideation, collaboration, and socialization opportunities and platform tools (see Appendix B). Quirky's business model is based on soliciting new product ideas for broad categories of consumer products and sharing a portion of the sales revenue (referred to as "influence" credits) with individual innovators who contributed to product ideation. Quirky invites community members to propose new product concepts and participate in the evaluation and selection of viable product ideas. Online community members can also participate in the co-development (e.g., product selection, design, development) of socially validated ideas. Once an idea is selected for manufacturing, the community members can participate in commercialization activities. Quirky launches new products through either licensing partnerships or a direct-to-market path via e-commerce or traditional retail distribution. At the time of our research, the Quirky SPD platform of 600,000 members had collaboratively developed and launched more than 150 consumer products. Quirky declared bankruptcy in 2014 because of uncontrolled manufacturing costs (Key, 2017; Kohler & Nickel, 2017), but the platform was reinstated with minimal changes in the SPD platform activities. As of January 2021, quirky.com had more than 1.3 million members.

### 4.2 Model Specification and Survey Measurements

Our literature review on OI models, review of previous SPD studies, and our direct observations of the quirky.com platform (Abhari et al., 2020) informed the operationalization of the core constructs in our research model—goals, affordances, intention, and contribution—in relation to the key SPD activities in which actors may engage (Johns, 2017). Table 1 lists

the construct definitions and measurement items we used for the field survey (also, see Appendix C).

**Goals.** We developed a hierarchical structure of goals that was theoretically informed and empirically determined and contextualized. Based on our understanding of the interrelationship (or lack thereof) between various goal measures suggested by self-determination theory, we modeled actors' extrinsic, internalized extrinsic, and intrinsic goals as three second-order constructs measured by seven reflective first-order constructs (Wetzels et al., 2009): monetary gain, recognition, learning, entrepreneurship, enjoyment, altruism, and socialization (see Appendix D). This hierarchical view of goals has been commonly used in the self-determination literature because of several empirical advantages (Sarstedt et al., 2019). First, higher-order constructs reduce the number of path model relationships, thereby achieving model parsimony (Polites et al., 2011). Second, the bandwidth-fidelity dilemma can be addressed by higher-order constructs (Cooke & Michie, 2001). The bandwidth-fidelity dilemma refers to the trade-off between the variety of information (bandwidth) and the thoroughness of testing to obtain more certain information (fidelity) (Salgado, 2018). Third, a higher-order construct provides a comprehensive measurement by drawing items from multiple domains and demonstrating construct dimensionality and nomological validity (Mowen & Voss, 2008). Fourth, higher-order constructs help reduce collinearity among indicators (Hair Jr. et al., 2017). Finally, higher-order goal constructs are deemed more likely to predict actors' intentions while maintaining a parsimonious view of goals suggested by self-determination theory. The measurement items for the seven lower-order goal constructs were mainly adapted from existing studies on OI and contextualized for SPD (Acar, 2019; Antikainen et al., 2010; Battistella & Nonino, 2012; Kahnert et al., 2012; Mack & Landau, 2020) (see Appendix D).

To decide whether the goal constructs should be modeled formatively or reflectively, we evaluated the causality, sensitivity, exchangeability, inclusivity, and predictability of the constructs (Cenfetelli & Bassellier, 2009; Jarvis et al., 2003; Petter et al., 2007; Windeler et al., 2017). Accordingly, we modeled extrinsic and internalized extrinsic goals as formative constructs and intrinsic goals as a reflective construct. First, self-determination theory suggests that each lower-order measure of externally inspired goals can partially predict (define) the relevant higher-order goal construct (i.e., the direction of causality is from lower-order goal measures to the higher-order goal construct) (Ryan & Deci, 2000). For extrinsic goals (the higher-order goal construct), money and recognition (the two lower-order goal constructs) are distinct goals, each explaining one form of external rewards—*external*

*regulation* and *introjected regulation*—but together providing a comprehensive understanding of extrinsic goals in the OI context (Ryan & Deci, 2000). Likewise, learning and entrepreneurship manifest *identified regulation* and *integrated regulation*, two distinct forms of internalized extrinsic goals (Ryan & Deci, 2000; von Krogh et al., 2012). Together, they capture identified and integrated regulations (cf. Petter et al., 2007) that are sufficiently inclusive to capture the essence of the internalized extrinsic goals (cf. Diamantopoulos & Winklhofer, 2001) relevant to the SPD context.

Second, extrinsic and internalized extrinsic goal constructs are also sensitive to the exclusion of any lower-order construct for reason of being inclusive. For example, learning and entrepreneurship goals are two different ways in which actors internalize the regulation of externally significant goals (von Krogh et al., 2012). Learning relates to personal development whereas entrepreneurship relates to professional development; neither by itself captures the full meaning of internalized extrinsic goals relevant to SPD. Third, change in one of the lower-order formative goal constructs does not necessarily imply an equal change in the other lower-order constructs. Entrepreneurship and learning, similar to monetary gain and recognition, cannot be substituted for each other because each may change independently (J. Zhang et al., 2016). Therefore, omitting one of them would alter the definition and comprehensiveness of the higher-order construct. There is also empirical evidence that these lower-order goals are not interchangeable (J. Zhang et al., 2016).

Finally, the literature suggests that actors' psychological needs (autonomy, competence or relatedness) and goal-directed behavior are respectively antecedents and consequences of the goal constructs (Ciani et al., 2011; Deci et al., 2017). The dimensions of extrinsic goals (monetary gain and recognition) and internalized extrinsic goals (learning and entrepreneurship) can satisfy different needs and result in different behaviors (Ryan et al., 1996). In this regard, our empirical case studies of SPD (including interviews with and observation of SPD members' discussions) (Abhari et al., 2020) as well as our multistage survey instrument development process provided additional assurance that these dimensions capture the most influential extrinsic and internalized extrinsic goals for SPD actors.

In light of the arguments presented above, we modeled extrinsic and internalized extrinsic goals as formative constructs. However, we are not able to make this claim for intrinsic goals—enjoyment, altruism, and socialization—since they are associated with inherent human emotional needs (intrinsic regulation) (Ryan & Deci, 2000; Ryan et al., 1996). Therefore, we modeled intrinsic goals as a reflective second-order construct.

**Table 1. Table of Contextualized Construct Definitions**

	<b>Constructs</b>	<b>Definitions</b>
<b>Extrinsic goals</b>	Monetary Gain (MNG)	Intend to obtain direct or indirect financial benefits associated with SPD performance
	Recognition (RCN)	Intend to acquire status or fame accorded to SPD qualifications, performance, or contribution
<b>Internalized extrinsic goals</b>	Entrepreneurship (ENT)	Intend to orientate conduct towards and become acquainted with entrepreneurial tasks and outcomes
	Learning (LRN)	Intend to acquire knowledge and skills in new product development
<b>Intrinsic goals</b>	Altruism (ALT)	Intend to undertake selfless actions that benefit other SPD community members
	Enjoyment (ENJ)	Intend to experience enjoyment from participation or engagement in SPD
	Socialization (SCL)	Intend to connect, interact, socialize, and network with other SPD community members
<b>Perceived participation affordances</b>	Perceived ideation affordances (PIA)	Perception that the platform's participation affordances can support submitting new product ideas/concepts
	Perceived collaboration affordances (PCA)	Perception that the platform's participation affordances can support collaborating with other network members to develop or improve new product ideas/concepts
	Perceived socialization affordances (PSA)	Perception that the platform's participation affordances can support socialization tasks such connecting, communicating, and networking
<b>Continuous intention</b>	Continuous intention to ideate (CII)	Intention to continue submitting new product ideas or concepts for consideration
	Continuous intention to collaborate (CIC)	Intention to continue collaborating with other members in SPD ('influence' projects)
	Continuous intention to socialize (CIS)	Intention to continue socializing with other members during the process of SPD
<b>Behavior</b>	Actual contribution	The number of new ideas submitted, and the number of products 'influenced' (collaborated on).

**Affordances.** We modeled perceived participation affordances as three first-order reflective constructs, namely perceived platform ideation affordances, perceived platform collaboration affordances, and perceived platform socialization affordances (see definitions in Table 1). Each affordance construct relates to the key action possibilities identified by prior research on OI and contextualized for this study of SPD (Mathiesen et al., 2013; Olapiriyakul & Widmeyer, 2009; Tan et al., 2016). Since the constructs and their measurements were newly developed for this survey, we assessed face validity and content validity using two independent expert panels.<sup>1</sup> The refined measurement instrument was then pilot tested with Quirky members before the official field survey.

**Intention.** The reflective measurement items for continuous implementation intention to contribute,

including continuous intention to ideate, continuous intention to collaborate, and continuous intention to socialize, were adapted to reflect the SPD context from previous studies on continuous behavioral intention in virtual collaborative communities (Bhattacharjee & Premkumar, 2001; Chen, 2007; Y. Zhang et al., 2010).

**Actual contribution.** Actual contribution was measured with the number of new ideas submitted and the number of products "influenced" (collaborated on) through the collaboration process. We used two sources to collect data about actual contribution: (1) respondents' self-reports of their contributions via a follow-up survey, and (2) respondents' actual contributions (i.e., number of new product ideas submitted and influenced as a collaborator) that we observed in the Quirky profiles of study participants who had voluntarily provided their Quirky public user profile.

<sup>1</sup> We used a card-sorting technique in which a panel of judges sorted the measurement items suggested by the literature and contextualized for Quirky into separate affordance categories based on the similarities and differences among items. Then, based on their placement and comments, the items were reexamined, and ambiguous items were modified or

eliminated. The subscales were then combined into an overall instrument for a second round of the card-sorting exercise (Moore & Benbasat, 1991). See also Abhari et al. (2017) for a full account of the development of the SPD affordances measurement instrument.

### 4.3 Pretest and Pilot Study

A pretest was designed to assess respondent concerns and questionnaire-related issues. The survey questionnaire was circulated among 30 researchers familiar with both the concepts and the context of this study to solicit feedback on the wording and presentation of the questions. We invited five active members of the Quirky community for follow-up interviews to assess the questions, resulting in further adjustments of the survey instrument. We then conducted a pilot study via online survey to assess the proper functioning of the survey instrument. The pilot study collected data from 72 randomly selected Quirky members and helped establish the required reliability and validity for all the constructs.

### 4.4 Field Survey

We collected data for the field survey from a random sample of Quirky members. Out of 600,000 potential respondents at the time of study, 1,000 Quirky members were randomly selected (based on a unique six-digit user ID defining their profile URLs) and invited via direct message to participate in an online survey. As an incentive, all those who submitted complete responses were offered a \$10 gift card of their choice. Of the 320 Quirky members who responded, we used 264 responses after screening out incomplete data and data from respondents with less than one month of experience with Quirky. To identify actors with prior SPD experience on Quirky, respondents were first asked to indicate their own experience with Quirky in terms of ideation, collaboration, and socialization. After that, respondents were presented with a series of Likert-type questions to assess their goals to contribute to Quirky, their perception of participation affordances, and the continuous intentions to ideate, collaborate, and socialize. Finally, respondents' demographic information (e.g., gender, age, education, employment) was collected as control variables.

One month after the completion of the field survey, a follow-up questionnaire to assess Quirky members' actual contributions was sent to respondents who had voluntarily provided an email address or link to their profile. The follow-up survey included a question on the number of product ideas submitted and the number of products influenced (collaborated on) by the respondents during the last month. A total of 103 Quirky members either responded to the follow-up survey (78) or provided an answer via their profile (25). The sample size satisfies guidelines suggested for PLS sample sufficiency (Hair Jr. et al., 2013).

## 5 Data Analysis

We used SmartPLS (Ringle et al., 2015) to validate both the measurement and structural properties of our

research model. In our study, PLS analysis is preferred over other analytical techniques because it simultaneously assesses the psychometric properties of the measurement items (i.e., the measurement model) and analyzes the direction and strength of the hypothesized relationships (i.e., the structural model). PLS also facilitates the modeling of formative constructs and it is recommended for the hierarchical model evaluation used in this study (Hair Jr., 2011; Wetzels et al., 2009). The hypotheses, except H9, were tested by using the first survey (n=264). We used the follow-up study (n=103) to test the relationship between continuous intention constructs and actual contribution (H9a-c).

### 5.1 Demographics and Actor Profile Data

Table 2 summarizes the demographics of our sample. More females participated in the survey than males. A large majority of respondents were between 26 and 65, and over 70% had at least some college education. Close to 60% of the respondents were employed outside of their participation in the SPD. Respondents with less than one month of experience with Quirky were screened from further analysis. More than 76% of the respondents had more than six months of experience with Quirky and more than 70% visited Quirky at least once a week. A large majority of respondents had recent experience with ideation (82%), collaboration (100%), and/or socialization (85%) on Quirky. Over 80% of the respondents had also received monetary credits for ideation or collaboration (referred to as "influence" credits in the Quirky community), an indicator of active participation in SPD.

### 5.2 Evaluation of 1st-Order Measurements

We ran an exploratory factor analysis (EFA) to check the dimensionality of the proposed goal constructs. We first used maximum likelihood with oblique rotation (direct oblimin) to investigate the relative importance of each item. Oblique rotation was used to preserve the unique variance of each measure, achieve more generalizable results, and render a more optimum solution (Costello & Osborne, 2005; Petter et al., 2007). The results show that the Kaiser-Meyer-Olkin measure of sampling adequacy is 0.88 (above the commonly recommended value of 0.6) and that Bartlett's test of sphericity is significant ( $\chi^2 = 4936, p = 0.00$ ), indicating that the correlations between items are sufficiently large for EFA (Hair Jr. & Anderson, 2010). These overall indicators suggest that factor analysis is suitable for all 28 items. An examination of the eigenvalues revealed that the first seven components with eigenvalues greater than 1 explained 75% of the variance in total.



**Table 2. Descriptive Statistics and Respondents' Profiles**

<b>Gender</b>	Male	39.8%	<b>Education</b>	High school	1.4%
	Female	52.5%		Some college	24.6%
	Undisclosed	7.8%		College graduate	22.1%
			Post-graduate degree	28.3%	
			Other	15.2%	
			Undisclosed	7.8%	
			Retired	6.1%	
<b>Age</b>	19 or younger	1.2%	<b>Employment</b>	Full-time employed	45.9%
	19 - 25	13.9%		Part-time employed	13.5%
	26 - 45	43.0%		Self-employed	17.6%
	46 - 65	27.5%		Unemployed	4.1%
	66 and older	6.6%		Undisclosed	7.8%
	Undisclosed	7.8%			

We adopted the seven-component solution because of the theoretical support, the “leveling off” of eigenvalues on the screen plot after seven factors, and the insufficient number of primary loadings for the eighth factor and subsequent factors. We retained all the 28 items for goals, as they all had factor loadings higher than 0.4 ( $\pm 0.30$  = minimal,  $\pm 0.40$  = important,  $\pm 0.50$  = practically significant; Hair Jr. & Anderson, 2010). These analyses reveal seven distinct dimensions underlying SPD goals.

We followed the same procedure to assess the dimensionality of perceived participation affordances constructs. The Kaiser-Meyer-Olkin measure of sampling adequacy was found to be 0.86, above the commonly recommended value of 0.6, and Bartlett’s test of sphericity was also significant, indicating that the correlations between items were sufficiently large for EFA ( $\chi^2 = 1940, p = 0.00$ ). An examination of eigenvalues indicated that the first three components with eigenvalues greater than 1.0 explained 76% of the variance in total, supporting the three-component solution. We retained all the 12 items for perceived affordances, as they had factor loadings higher than 0.4 (Joe F Hair & Anderson, 2010). These analyses support three distinct dimensions underlying perceived affordances as we expected.

Next, we evaluated the measurement model by assessing construct reliability (item reliability and internal consistency), construct factorability, and construct validity (convergent validity and discrimination validity). As shown in Table 3, all the loadings of measurement items on their latent constructs, except one, exceed 0.7, indicating acceptable item reliability (Joseph F Hair et al., 2013). The cross-loadings are also reported in Appendix E. Cronbach’s alpha and composite reliability of all the constructs are higher than 0.7, indicating good internal consistency among the items measuring each construct (Hair Jr. et al., 2013). Three criteria were adopted to assess convergent validity and discriminant validity: (1) all average variance extracted (AVE) measures are higher than 0.50 (Hair Jr. et al., 2013); (2) the square root of the AVE of each construct is larger than the correlations of that construct with the other constructs (Fornell &

Larcker, 2006); and (3) the heterotrait-to-monotrait (HTMT) values are all well below the 0.90 threshold (Hair Jr. et al., 2013). The results of these tests suggest adequate convergent and discriminant validity. Lastly, we tested for common method bias using full collinearity assessment (i.e., vertical and lateral collinearity) (Kock 2015). All the pathological VIFs resulting from a full collinearity test range from 1.37 to 2.32 (see Appendix F), lower than the 3.3 threshold, suggesting the absence of common method bias (Kock & Lynn, 2012).

### 5.3 Evaluation of 2nd-Order Measurements

The evaluation of formative constructs—extrinsic and internalized extrinsic goals—involves an assessment of the formative indicators’ (predictive) validity and multicollinearity (Hair Jr. et al., 2013). Indicator validity, which gauges the strength and significance of the path from the indicator to the construct, was estimated using the PLS algorithm method with a bootstrapping of samples to calculate the weight (relative importance) and loading (absolute importance) of each indicator on its corresponding construct. As Table 4 shows, the weights and loadings of all the indicators are significant, suggesting satisfactory indicator validity (Hair Jr. et al., 2013). In this study, multicollinearity was tested by computing the variance inflation factor (VIF) of each indicator (Diamantopoulos & Winklhofer, 2001). All computed VIF values are well below the conservative threshold of 3.3, suggesting that multicollinearity is not a threat to the validity of the study’s findings (Hair Jr. et al., 2013). We also conducted additional quality assessment for higher-order intrinsic goals. Cronbach’s alpha and the composite reliability of higher-order intrinsic goals is 0.76, indicating satisfactory internal consistency (Joseph F Hair et al., 2013). The AVE of higher-order intrinsic goals is 0.68, higher than 0.50 threshold, and its square root is larger than the correlations of this construct with the other constructs (Fornell & Larcker, 2006; Hair Jr. et al., 2013).

**Table 3. Psychometric Properties of First-order Constructs**

Construct	Items	Loading	AVE	$\alpha$	CR	MNG	RCN	ALT	ENJ	ENT	LRN	SCL	CII	CIC	CIS	PIA	PCA	PSA
<b>Monetary gain</b> (M = 4.82; SD = 1.64)	MNG1	0.91	0.75	0.88	0.92	<b>0.86</b>												
	MNG2	0.81																
	MNG3	0.90																
	MNG4	0.84																
<b>Recognition</b> (M = 4.43; SD = 1.53)	RCN1	0.89	0.79	0.91	0.94	0.41	<b>0.89</b>											
	RCN2	0.90																
	RCN3	0.88																
	RCN4	0.89																
<b>Altruism</b> (M = 4.86; SD = 1.38)	ALT1	0.84	0.63	0.79	0.87	0.20	0.37	<b>0.79</b>										
	ALT2	0.90																
	ALT3	0.89																
	ALT4	0.47																
<b>Enjoyment</b> (M = 5.08; SD = 1.51)	ENJ1	0.95	0.86	0.94	0.96	0.27	0.22	0.56	<b>0.93</b>									
	ENJ2	0.95																
	ENJ3	0.95																
	ENJ4	0.86																
<b>Entrepreneurship</b> (M = 5.20; SD = 1.40)	ENT1	0.85	0.62	0.79	0.87	0.30	0.34	0.33	0.53	<b>0.79</b>								
	ENT2	0.73																
	ENT3	0.76																
	ENT4	0.81																
<b>Learning</b> (M = 5.39; SD = 1.23)	LRN1	0.87	0.69	0.85	0.90	0.23	0.50	0.41	0.43	0.57	<b>0.83</b>							
	LRN2	0.83																
	LRN3	0.82																
	LRN4	0.82																
<b>Socialization</b> (M = 4.81; SD = 1.41)	SCL1	0.90	0.79	0.91	0.94	0.23	0.50	0.59	0.45	0.15	0.33	<b>0.89</b>						
	SCL2	0.89																
	SCL3	0.87																
	SCL4	0.89																
<b>Continuous intention to ideate</b> (M = 5.27; SD = 1.46)	CII1	0.92	0.75	0.89	0.92	0.48	0.48	0.40	0.46	0.48	0.47	0.31	<b>0.87</b>					
	CII2	0.87																
	CII3	0.77																
	CII4	0.89																
<b>Continuous intention to collaborate</b> (M = 5.23; SD = 1.37)	CIC1	0.90	0.71	0.86	0.91	0.32	0.35	0.41	0.45	0.46	0.60	0.24	0.75	<b>0.84</b>				
	CIC2	0.87																
	CIC3	0.73																
	CIS4	0.87																
<b>Continuous intention to socialize</b> (M = 5.06; SD = 1.35)	CIS1	0.91	0.70	0.85	0.90	0.34	0.34	0.65	0.53	0.23	0.36	0.68	0.53	0.52	<b>0.84</b>			
	CIS2	0.89																
	CIS3	0.63																
	CIS4	0.87																
<b>Platform ideation affordances</b> (M = 5.16; SD = 1.33)	PIA1	0.92	0.77	0.90	0.93	0.36	0.36	0.34	0.42	0.43	0.50	0.24	0.64	0.57	0.41	<b>0.88</b>		
	PIA2	0.93																
	PIA3	0.82																
	PIA4	0.84																
<b>Platform collaboration affordances</b> (M = 5.25; SD = 1.25)	PCA1	0.82	0.69	0.85	0.90	0.25	0.25	0.30	0.37	0.34	0.53	0.26	0.45	0.61	0.39	0.59	<b>0.83</b>	
	PCA2	0.84																
	PCA3	0.86																
	PCA4	0.81																
<b>Platform socialization affordances</b> (M = 5.01; SD = 1.29)	PSA1	0.88	0.78	0.91	0.94	0.29	0.29	0.54	0.41	0.22	0.38	0.56	0.39	0.40	0.65	0.45	0.51	<b>0.88</b>
	PSA2	0.87																
	PSA3	0.90																
	PSA4	0.89																

Note: The diagonal elements are the square root of the shared variance between the constructs and their measures. Monetary gain (MNG); Recognition (RCN); Altruism (ALT); Enjoyment (ENJ); Entrepreneurship (ENT); Learning (LRN); Socialization (SCL); Continuous intention to ideate (CII); Continuous intention to collaborate (CIC); Continuous intention to socialize (CIS); Platform ideation affordances (PIA); Platform collaboration affordances (PCA); Platform socialization affordances (PSA).

**Table 4. Weights and Loadings of the Higher-Order Indicators**

	Construct	Indicator*			VIF	Loadings		Weights	
						Loadings**	t-value	Weights**	t-value
<b>Formative</b>	Extrinsic goals (EXG)	MNG	→	EXG	1.16	0.90	16.90	0.73	7.77
		RCN	→	EXG	1.16	0.73	8.83	0.46	3.95
	Internalized extrinsic goals (IEG)	ENT	→	IEG	1.50	0.80	13.41	0.38	3.54
		LRN	→	IEG	1.50	0.95	31.79	0.73	8.20
<b>Reflective</b>	Intrinsic goals (ING)	ENJ	←	ING	1.56	0.87	37.11	0.41	15.84
		ALT	←	ING	1.80	0.87	45.10	0.43	19.86
		SCL	←	ING	1.43	0.78	22.25	0.38	14.57

*Note:* \* Monetary gain (MNG), Recognition (RCN), Entrepreneurship (ENT), Learning (LRN), Altruism (ALT), Enjoyment (ENJ), Socialization (SCL). \*\* all loadings and weights are significant at  $p < 0.00$  level

## 5.4 Assessment of the Structural Model

We tested the structural model following the two-step procedure suggested by Wetzels et al. (2009) for hierarchical models. In the first step, the latent variable scores for the second-order constructs were obtained using PLS path modeling by specifying a latent variable that represents all the manifest variables of the underlying first-order latent variables (Wetzels et al., 2009). In the second step, we tested the hypotheses. The results of structural model analysis are illustrated in Figure 2 and summarized in Tables 5 and 6. As no control variables (age, employment, education, and gender) showed significant effects on the three types of continuous intention, they were excluded in further data analysis. As shown in Table 5, our model accounts for 56%, 54%, and 58% of variance in actors' continuous intentions to ideate, collaborate, and socialize, respectively. Extrinsic goals significantly influenced intention to ideate ( $\beta = 0.32, p < 0.001$ ), while internalized extrinsic goals significantly influenced intention to ideate ( $\beta = 0.18, p < 0.001$ ) and intention to collaborate ( $\beta = 0.41, p < 0.001$ ). Intrinsic goals exerted significant positive impact on intention to collaborate ( $\beta = 0.10, p < 0.05$ ) and intention to socialize ( $\beta = 0.57, p < 0.001$ ). Our data thus provide support for H1-H5. We did not find support for relationships that are not hypothesized in exploratory tests of other models.

Comparison of path coefficients using Cohen's  $f^2$  effect size (Selya et al., 2012) revealed that: (1) extrinsic goals ( $f^2 = 0.17$ ) have greater predictive power on intention to ideate when compared to internalized extrinsic goals ( $f^2 = 0.05$ ) goals, (2) internalized extrinsic goals ( $f^2 = 0.22$ ) are more important in driving intention to collaborate than are intrinsic goals ( $f^2 = 0.02$ ), and (3) intrinsic goals ( $f^2 = 0.48$ ) exert greater influence on intention to socialize than do any other goals.

We also tested the relationships between continuous intentions and actual contribution. Continuous intention to ideate ( $\beta = 0.26, p < 0.05$ ), collaborate ( $\beta = 0.37, p < 0.01$ ), and socialize ( $\beta = 0.29, p < 0.05$ )

exerted significant impact on actors' actual contributions, thus corroborating H9a-c. The three intention constructs account for 71% of variance in actual value creation.

Mediation analysis was conducted to explore the role perceived participation affordances play in mediating the impact of goals on actors' continuous intentions. In this study, consistent with more recent practices for testing indirect influence (Rucker et al., 2011), we adopted the bootstrapping method as the more rigorous and powerful approach to assess the mediating role of perceived participation affordances (Preacher & Hayes, 2008). The bootstrapping method is the preferable approach since the indirect effect is measured directly using this method, rather than merely inferred to exist through a sequence of tests. Moreover, the bootstrapping method imposes no assumption of the normality of the dataset, and thus is recommended for studies with small sample sizes. In this study, the 95% confidence interval of the indirect effects was obtained through 5,000 bootstrap resamples. The results of our analysis (see Table 6) reveal that perceived participation affordances significantly carry the influence of the goal constructs on all the hypothesized intention constructs.

Specifically, the results confirm the role of perceived ideation affordances in mediating the relationship between extrinsic goals and intention to ideate (H6a:  $\beta_{Indirect} = 0.12, CI = 0.06$  to  $0.20$ ) and the relationship between internalized extrinsic goals and intention to ideate (H6b:  $\beta_{Indirect} = 0.17, CI = 0.10$  to  $0.24$ ), as none of the bias-corrected 95% confidence intervals contain zero. Similarly, the results confirm the role of perceived collaboration affordances in mediating the relationship between internalized extrinsic goals and intention to collaborate (H7a:  $\beta_{Indirect} = 0.17, CI = 0.10$  to  $0.24$ ) and the relationship between intrinsic goals and intention to collaborate (H7b:  $\beta_{Indirect} = 0.05, CI = 0.01$  to  $0.11$ ). Lastly, the results support the role of perceived socialization affordances in mediating the relationship between intrinsic goals and intention to socialize (H8:  $\beta_{Indirect} = 0.16, CI = 0.08$  to  $0.24$ ). Therefore, our findings support H6a-b, H7a-b, and H8.

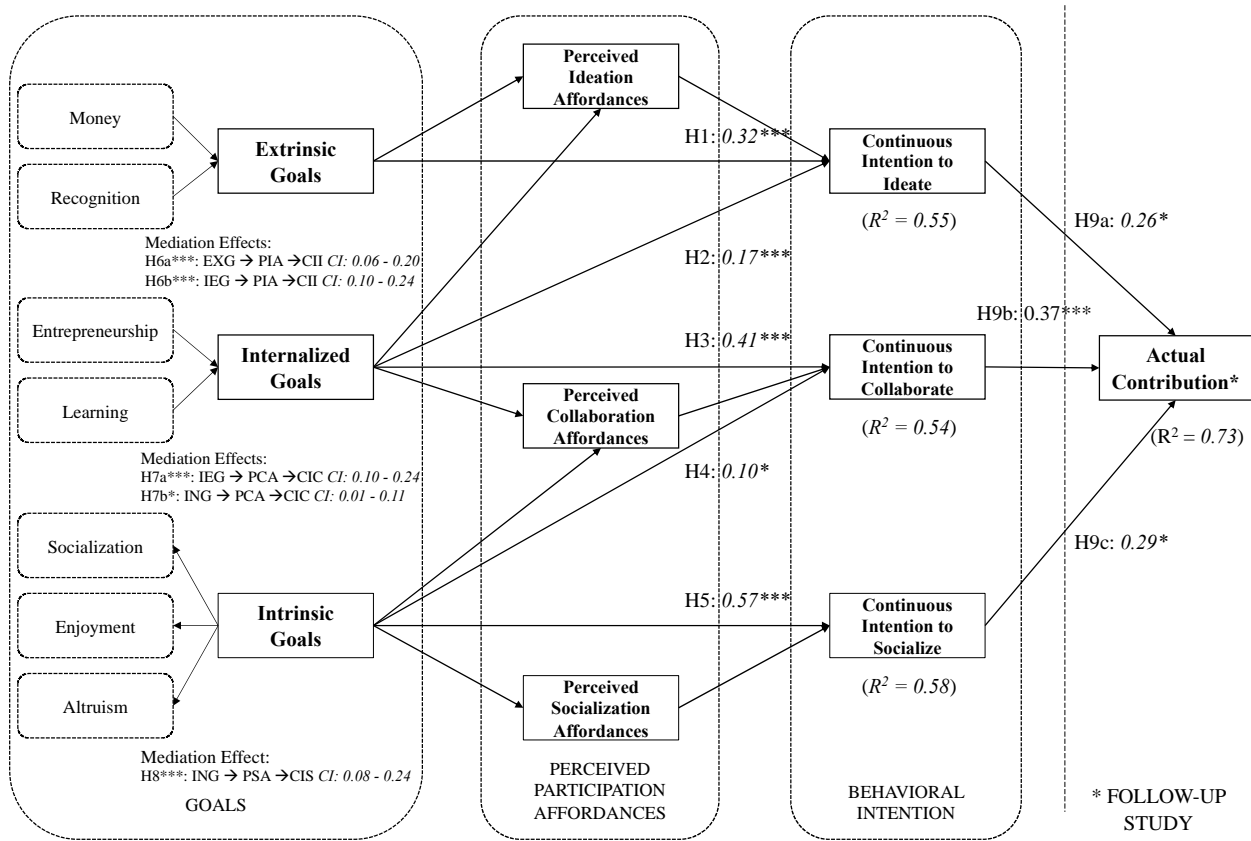


Figure 2. Hypothesis Testing Results

Table 5. Results of the Structural Model Assessment

Dependent variable	Hypothesis	Support	$\beta$	$t$	$R^2$	$Q^2$
Continuous Intention to ideate (CII)	H1: EXG → CII	Supported	0.32***	6.16	0.56	0.53
	H2: IEG → CII	Supported	0.18***	2.81		
Continuous Intention to collaborate (CIC)	H3: IEG → CIC	Supported	0.41***	5.27	0.54	0.52
	H4: ING → CIC	Supported	0.10*	2.00		
Continuous intention to socialize (CIS)	H5: ING → CIS	Supported	0.57***	10.24	0.58	0.57
Actual contribution (AVC)	H9a: CII → AVC	Supported	0.26*	2.17	0.73	0.55
	H9b: CIC → AVC	Supported	0.37***	4.16		
	H9c: CIS → AVC	Supported	0.29*	2.19		

Notes: Extrinsic goals (EXG), Internalized extrinsic goals (IEG), Intrinsic goals (ING)  
 \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ ; ns = no significant;  $\beta$  = path coefficients;  $R^2$  = determination coefficient;  $Q^2$  = predictive relevance (calculated by Blindfolding).



**Table 6. Results of the Mediation Assessment**

Mediator	Hypothesis	Indirect effect	t-value	Confidence interval	Supported
Perceived ideation affordances (PIA)	H6a: EXG → PIA → CII	0.12	3.40	0.06 - 0.20	Supported
	H6b: IEG → PIA → CII	0.17	4.61	0.10 - 0.24	
Perceived collaboration affordances (PCA)	H7a: IEG → PCA → CIC	0.17	4.58	0.10 - 0.24	Supported
	H7b: ING → PCA → CIC	0.05	2.15	0.01 - 0.11	
Perceived socialization affordances (PSA)	H8: ING → PSA → CIS	0.16	4.05	0.08 - 0.24	Supported

*Note:* Extrinsic goals (EXG), Internalized extrinsic goals (IEG), Intrinsic goals (ING), Continuous intention to ideate (CII), Continuous intention to collaborate (CIC), Continuous intention to socialize (CIS).

## 6 Discussion

This study theoretically derives and empirically tests a model of actors' goal-directed behavior on SPD platforms to inform OI research and practice. Drawing on self-determination theory as well as literature on OI and affordances, we advance hypotheses on how actors' goals influence their ongoing participation in SPD activities and how their perception of actions afforded by the SPD platform also carries the influence of goals on behavioral intention. We tested the hypothesized relationships between goals, perceived affordances, intentions to participate, and actual participation in SPD in a field survey of actual SPD participants, an instantiation of OI. This model provides a nuanced understanding of the distinctive influences of different goals (extrinsic, internalized extrinsic, intrinsic) that individual innovators bring to the OI context on three essential categories of OI behaviors (ideation, collaboration, socialization). Distinguishing the indirect influence of actor goals (via perceived platform affordances of the OI platform) from the direct impact of actor goals helps explain how the OI platform influences actors' behavioral intentions.

The study's model and findings provide a theoretical basis to consider whether and how actor goals align with the innovation behaviors intended (targeted) by the OI business model. They also highlight the delicate balancing that OI platform sponsors face to engage participants, individually and collectively, across the spectrum of OI behaviors through participation rules, incentives, platform governance, and innovation activities that may appeal to different actor goals. Of note, we found that all three types of goals contribute to an actor's continuous intention to participate in SPD but that each goal type has distinctive implications for the innovation behaviors the actor is likely to engage in. Interestingly, we found that no one goal category predicted all three types of innovation behaviors (i.e., ideation, collaboration, and socialization).

OI platforms need to engage individual innovators in generating ideas for new products or services

(ideation). The findings of this study indicate that extrinsic and internalized extrinsic goals influence actors' intention to ideate. Consistent with previous research in other OI contexts (Chen et al., 2012; Salehan et al., 2014), we found extrinsic goals to be the strongest predictor of actors' continuous intentions to ideate on the SPD platform. This highlights the importance of the OI platform rules and processes to attract creative individuals to ideation activities through tangible rewards (money and recognition) and, secondarily, through opportunities to learn about innovation.

However, OI platform rules that appeal primarily to extrinsic goals are less likely to elicit actors' collaborative or socialization behaviors. Very large external rewards (e.g., cash prizes) may encourage individuals to work together and compete as a team but discourage them from working together as an innovation community (Liao & Xu, 2020). Studies of idea competition platforms demonstrate that competition for extrinsic rewards (particularly cash prizes) may even suppress collaborative OI behaviors or encourage destructive behaviors (Boudreau et al., 2011; Faullant & Dolfus, 2017; Fuller et al., 2014; Hutter et al., 2015). This is a potential problem for OI models like SPD, which attempt to attract creative individuals with extrinsic rewards while also encouraging collaborative and community building behaviors. That is, OI platforms that seek to engage creative individuals beyond initial ideation processes must consider other types of actor goals along with goal-relevant innovation opportunities.

Collaboration among diverse stakeholders is a core premise of SPD as well as many OI models (Annosi et al., 2020; Fuller et al., 2014; Ungureanu et al., 2020). As hypothesized, our findings indicate that internalized extrinsic and intrinsic goals are significant predictors of actors' continuous intention to collaborate with others on SPD platforms, and internalized extrinsic goals are a stronger predictor of collaboration than are intrinsic goals. This finding suggests that individuals engage in collaborative activities, such as idea refinement and product development, primarily to enhance their own

innovation capacity and develop entrepreneurship skills (internalized extrinsic goals), and to a lesser extent, to network with other members, participate in the process of collaboration, and help others. An implication of our study of SPD is that extrinsic rewards (such as influence points) are less likely to engage SPD actors in collaborative behaviors than would opening a variety of innovation processes (e.g., refining design, market research) to community members, thus allowing them to learn about innovation processes, develop their entrepreneurial skills and work together with other creative individuals on fun and challenging tasks.

SPD platforms, along with some other OI models, seek to stimulate socialization among participants to build community and to facilitate and encourage continuing participation in ideation and collaboration. We theorize that socialization behaviors in SPD are driven by intrinsic goals, and our study's findings indicate that intrinsic goals do predict actors' continuous intentions to socialize with others on SPD platforms. That is, when actors expect opportunities to be fun, contribute to the community's innovation success, and build their personal networks on the platform, they are likely to engage in socialization behaviors on an OI platform. Socialization behaviors also assist actors in pursuing other goals through ideation or collaboration behaviors (Yetis Larsson et al., 2019). However, an OI platform that too strongly promotes socializing carries some risk of distracting members from ideation or collaboration tasks (Abhari et al., 2018). If socialization behaviors veer away from the platform's core focus on innovation towards general social interactions, the OI platform's identity as a serious professional innovation community may be weakened (cf. Mattson & Davidson, 2018; Ray et al., 2014).

We theorize and empirically demonstrate that perceived SPD participation affordances mediate the relationship between goals and continuous intentions to participate, confirming perceived participation affordances as mechanisms through which distinct types of goals influence actors' SPD behaviors. SPD is made possible through the sociotechnical platform that instantiates OI process rules and provides the technical features and functions that individual community members use to participate in innovation activities. However, on multifeatured OI platforms, actors must seek out and attend to relevant features that afford actions they are motivated to undertake. We found that both extrinsic and internalized extrinsic goals influenced how SPD actors perceive ideation affordances, and their perceptions influenced their intentions to continue to ideate. Similarly, internalized extrinsic and intrinsic goals increased actors' awareness of how the SPD platform affords collaborative behaviors, contributing to actors' intentions to collaborate. Intrinsic goals increased

actors' attention to how SPD features could afford socialization behaviors, increasing their intentions to engage in socializing behaviors.

Finally, our results show that actors' continuous intentions to ideate, collaborate, and socialize have a significant impact on their actual, measurable contributions to the SPD platform ( $R^2 = 0.73$ ), providing support for our conceptualization of actor OI behaviors in terms of ideation, collaboration, and socialization.

## 6.1 Implications for Research

Our study integrates and extends earlier OI research to develop a comprehensive, theory-based, and empirically tested framework of goal-oriented OI behavior. Our empirical study is contextualized for SPD platforms. However, the framework can inform studies of other OI platforms as well—for instance, for considering potential synergies and conflicts in actor goals and behaviors in hybrid OI models, such as innovation contests within collaborative open source communities (Liao & Xu, 2020). It also provides a common foundation for comparative studies across OI platform types with differing rules, rewards, openness of innovation activities, and community governance.

Our model has several key advantages over existing approaches. Drawing on OI literature broadly, we conceptualize actors' continuous intention to contribute as three distinct constructs—intention to ideate, intention to collaborate, and intention to socialize. In contrast to the single-construct approach adopted by previous studies of OI participation (e.g. Fernandes & Remelhe, 2016; Zhang et al., 2015), our model provides a finer-grained view of OI behaviors, which allows for examining how different goal types lead to different OI behaviors. This approach extends beyond modeling OI as an ideation process by differentiating between ideation (idea submission) and collaboration (ongoing and iterative interactions to improve ideas) as two distinct goal-directed OI behavioral categories. We also account for social aspects of OI to highlight community-building behaviors that underlie and support project-focused ideation and collaboration. These behavioral categories are sufficiently general to apply across a range of OI platforms while allowing for contextualized operational definitions for a specific setting, as we did here for SPD.

Drawing from self-determination theory and prior studies on OI (Acar, 2019; Benbya & Belbaly, 2010; Füller, 2010; von Krogh et al., 2012), our model extends the understanding of actor goals beyond the extrinsic-intrinsic dichotomy to articulate a parsimonious model of actor goals for OI comprised of three higher-order goal constructs (extrinsic, internalized extrinsic and intrinsic goals) with seven

lower-order goals. Our specification of higher-order goal categories drew from across the OI literature, and this structure was then operationally defined and tested in the context of SPD, an OI model that encompasses a wide range of OI activities and processes. These categories provide a comprehensive framework of OI-relevant goals to study goal-directed behaviors in a variety of OI models, which would facilitate comparison of how goals influence OI behaviors under differing business rules and on different OI platforms.

Our research model develops a nuanced explanation of how different goals relate to various OI behaviors and demonstrates the relative importance of each goal category in influencing different facets of OI behaviors in the SPD context. Unraveling and contextualizing these goal-behavior relationships can help researchers investigate why some innovation behaviors do (or do not) develop on some platforms, based on the platform's appeal to actors' goals. We do not suggest that there is an optimal or "right" mix of extrinsic, internalized extrinsic, and intrinsic goals and of ideation, collaboration, and socialization behaviors for all OI platforms. SPD platforms generally appeal across this spectrum and thus provide a research context to examine multiple goals and behaviors simultaneously. OI platforms dedicated to idea competitions, on the other hand, might focus primarily on extrinsic goals to motivate ideation behaviors (Hofstetter et al., 2018; Mack & Landau, 2020), whereas open source communities generally prioritize collaborative behaviors aligned with internalized extrinsic goals (Belenson & Schankerman, 2015; Li et al., 2012). Our model provides a comprehensive framework to assess what goals-behavior relationships may or may not be present or relevant in different contexts.

An actor's goals directly influence intentions to participate in innovation activities (or not), but the actor must do so via features and functions on the OI platform that afford desired actions. We bring the OI platform to the theoretical foreground as an integral component of goal-behavior relationships by arguing that perceptions of platform affordances are influenced by actors' goals, and that perceived affordances affect their likelihood of engaging in an afforded action. This approach is consistent with the view of affordances as relational between an actor, an artifact, and the actions afforded (S. K. Evans et al., 2017; Fayard & Weeks, 2014; Nagy & Neff, 2015; Volkoff & Strong, 2013). However, our goal-affordances-behavior model adds nuance to the concept of affordances by suggesting that perceptions are formed under the influence of actors' goals and that perception of affordances increases the likelihood that an afforded action will occur. This role of perceived affordances in mediating the influence of actor goals on behavioral intentions has not yet received attention in the IS literature, as quantitative

approaches to specifying affordances and hypothesizing relationships between affordances and other constructs are still rare (S. K. Evans et al., 2017). Assessing how perceived affordances mediate goal-behavior relationships will be useful in OI platform design studies. OI platform designers can consider whether participants perceive designed affordances as meeting their goals through the actions afforded, and thereby increase their intentions to participate in OI activities, as intended by the platform owner. The mediating influence of perceived affordances is also relevant to study other domains, such as the use of persuasive or "nudge" technologies on social platforms intended to change individuals' behaviors (Fogg, 1999; Piwek et al., 2016).

## **6.2 Implications for Practice**

Understanding why actors participate in OI platform activities as they do can inform the design of business rules and sociotechnical features to better align actors' goals and behaviors and to maintain their interest (Bauer et al., 2016; Bechmann & Lomborg, 2012; Henkel et al., 2014; Sorensen & Torfing, 2011). Our study highlights the differential impact of three goal types on three general categories of OI behavior and suggests that platform designers consider what innovation behaviors they most want to encourage through the design of reward systems and through the openness of innovation activities that appeal to different actor goals. Rewards such as monetary gain and opportunities for recognition are likely to be more effective in appealing to actors' extrinsic goals and engaging them in ideation tasks. Opening innovation processes and innovation activities to the community presents opportunities for learning and developing entrepreneurship capacity that appeal to internalized extrinsic goals and thus may be more effective to encourage collaboration. Highlighting how participation can be fun and increase the welfare of the SPD community, for instance through success stories, could appeal to actors' intrinsic goals and thus heighten their intentions to socialize. Platform sponsors should also be aware that actor goals and behaviors may at times be in conflict or incongruent with the OI sponsor's intentions. Reviewing actual use or surveying users regularly could help identify mismatches. Our research model and construct definitions provide insights on how to do so.

Effective platform design entails affording the actions actors desire through features and functionalities. While it is important that an OI platform be easy and enjoyable to use (hence addressing some intrinsic goals), our study suggests that how actors perceive features and functions enable them to fulfill their own goals is a mechanism to drive OI behavioral intention. Features that are not clearly relevant to actors' goals are not only likely to be ignored but may clutter the

user interface and mask desirable affordances. Because different actors may perceive the actions afforded by various features in different, even unexpected ways, observing users' behaviors and querying the rationale for their actions (or lack of action) could provide useful feedback for designers. Our research model outlines a useful framework for eliciting such feedback.

## **7 Conclusion, Limitations, and Future Research**

Through internet and social media technologies, creative individuals around the world can now engage in innovation through a variety of OI platforms and business models. To realize the full potential of these creative crowds, OI sponsors need to understand how individuals' goals influence the types of innovative behaviors they are eager to participate in and to align actor goals and innovation opportunities with the OI model through incentives, rules, processes, and technology affordances (Lifshitz-assaf, 2018; Majchrzak et al., 2020; Randhawa et al., 2016). Our study contributes to both IS and OI research a comprehensive, theoretically grounded foundation for examining actors' goal-directed behavior on individual-level OI platforms. Our research model highlights general OI behavioral categories and offers a nuanced, systematic way to examine the relative influence of diverse actor goals on these OI behaviors. This is particularly important when OI platforms engage participants broadly in innovation because diverse goals motivate individuals' participation in different innovation behaviors (Bogers et al., 2017; Kohler & Chesbrough, 2020). We advance the understanding of technology affordances for OI (cf. Nambisan et al., 2017) by theorizing the mediating influence of perceived platform participation affordances in goals-behavior relationships. Our study of social product development also builds knowledge of a novel open source model and complements studies

of OI in new product development (R. D. Evans et al., 2018; Hidayanti et al., 2018).

In this paper, we empirically examined OI goals and behaviors in a field survey of active participants on an SPD platform, an approach that strengthens the external and ecological validity of the study. Our empirical findings are limited to the context studied but our theoretical model is analytically general and could inform empirical studies of other OI settings (Lee & Baskerville, 2003). Research methods such as case studies, in-depth interviews, or user-experience experiments can help to further assess the robustness of our model for other OI platforms. Longitudinal studies in which researchers follow actors' behavior in an OI platform could help assess how the (re)design of business models and platform features influence the goals that participants bring to the platform, their perception of afforded actions, and the activities they participate in.

This study lays a foundation for comparative studies of alternative OI models, which could build knowledge of OI actors' goal-directed behaviors more generally. Cross-sectional studies of actor behavior on competing platforms or in other business models could then highlight the implications of different rewards, rules, structures, and processes across OI platforms. Beyond the goals-behavioral links, future studies of OI could consider approaches to social engagement, extent of actor involvement, flexibility of roles, use of social technology, and diversity of activities performed by actors on OI platforms. Such studies could inform the design of the mix of technological capabilities for OI platforms and innovation activities directed at different sets of actor goals (Ardolino et al., 2020; Belenzon & Schankerman, 2015; Nambisan et al., 2017). Finally, future research could also consider the influence of individual characteristics such as personality, priorities, risk tolerance, and experience on actors' behaviors relative to goals.



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## Appendix A

**Table A1. Common Open Innovation Models**

	<b>SPD</b>	<b>Crowdsource</b>	<b>Innovation marketplace/contest</b>	<b>Customer community / user innovation</b>	<b>Opensource community</b>
<b>Open innovation business models</b>	OI model in which social technologies and social mechanisms are used to mobilize actors in support of new product development (Forbes & Schaefer, 2017; Hidayanti et al., 2018; Peterson & Schaefer, 2014; D. Wu et al., 2016) Example: Quirky (quirky.com)	A business model solicits creative ideas from a broad community on a corporate or a third-party Internet platform (e.g., Burtch et al. 2013; Schenk and Guittard 2011; Zheng et al. 2011). Example: Threadless (threadless.com)	A third-party (intermediary) platform that connects problem owners to a large community of potential problems solvers mainly through organizing an innovation contest (e.g., Lai and Tsai 2010; Muhdi et al. 2011). Example: Innocentive (innocentive.com)	Consumer co-production or participatory design that entails direct or indirect customer involvement in R&D processes, usually in the initial development phases (e.g., Etgar, 2008; Nambisan, 2002; von Hippel, 2005; West & Lakhani, 2008). Example: Lego Idea (ideas.lego.com)	Open innovation communities dedicated to developing non-proprietary software solutions (e.g., Von Hippel and von Krogh 2003; Lakhani and von Hippel, 2003). Example: Linux kernel (linuxfoundation.org)
<b>Key activities/features</b>	<ul style="list-style-type: none"> <li>▪ Submit new product concept</li> <li>▪ Help improve others' ideas</li> <li>▪ Vote on best concepts</li> <li>▪ Collaborate to develop new products</li> <li>▪ Collaborate to commercialize new products</li> <li>▪ Create profile to network</li> </ul>	<ul style="list-style-type: none"> <li>▪ Submit new product ideas</li> <li>▪ Browse and choose microtasks</li> <li>▪ Complete microtasks online or offline</li> <li>▪ Build a qualification profile</li> </ul>	<ul style="list-style-type: none"> <li>▪ Browse and choose innovation contest</li> <li>▪ Submit solutions for predefine problems</li> <li>▪ Submit innovation for evaluation</li> <li>▪ Build portfolio</li> </ul>	<ul style="list-style-type: none"> <li>▪ Join topic communities</li> <li>▪ Share new product or service ideas</li> <li>▪ Browse ideas</li> <li>▪ Discuss ideas</li> <li>▪ Vote for ideas</li> <li>▪ Build profile</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify code improvements</li> <li>▪ Develop code</li> <li>▪ Test own or others' code</li> <li>▪ Review code changes</li> <li>▪ Commit new code and document changes</li> <li>▪ Network to communicate experience</li> </ul>
<b>Process: Ideation</b>	Ideas submitted individually or jointly for a broad range of tasks mainly through social processes.	Complete tasks or submit ideas on formally structured process and pre-defined requirements.	News solutions submitted individually and privately based on pre-identified problems in form of innovation contest.	New ideas shared publicly based on a problem or opportunity identified by the community or corporate sponsor.	New codes or solutions committed based on open but structured process to address existing needs or development opportunities.
<b>Process: Collaboration</b>	Defined mainly by community members in different product categories and systematically co-governed with various collaboration opportunities.	Defined by corporate innovation sponsors with formal execution mechanism and some collaboration opportunities.	Defined by corporate innovation sponsors via innovation brokers with limited collaboration opportunities (e.g., joint submission).	Defined by corporate innovation sponsors based on inputs from the user community with limited collaboration options (e.g., only discussion).	Defined by innovation sponsor, user community or innovation community members with high collaboration opportunities but limited in scope.

<p><b>Process:</b> <i>Socialization</i></p>	<p>Socioprofessional network with various networking options for collaboration and knowledge sharing. Socialization is not necessarily tied to projects.</p>	<p>Membership platform typically with no or limited networking opportunities.</p>	<p>Professional networks with no or limited networking options for collaboration within innovation contests.</p>	<p>Brand communities with networking options like following, commenting, and discussion of ideas.</p>	<p>Formal and informal support communities with some networking options for collaboration and knowledge-sharing.</p>
<p><b>Typical appeals to actor goals</b></p>	<ul style="list-style-type: none"> <li>▪ Compensation and recognition for contributors</li> <li>▪ Learning opportunities offered by both sponsor and community</li> <li>▪ Opportunities for fulfilling or entertaining activities, networking, and helping others</li> </ul>	<ul style="list-style-type: none"> <li>▪ Compensation and recognition (if any)</li> <li>▪ Learning opportunities offered by sponsor</li> <li>▪ Entertaining opportunities but limited options for networking or helping others</li> </ul>	<ul style="list-style-type: none"> <li>▪ Compensation and recognition for winning ideas</li> <li>▪ No systematic learning mechanisms</li> <li>▪ Limited opportunities for entertaining activities, networking, or helping others</li> </ul>	<ul style="list-style-type: none"> <li>▪ No compensation and limited recognition (if any)</li> <li>▪ No learning mechanisms offered by sponsor but some from community</li> <li>▪ Fulfilling or entertaining activities with some networking opportunities</li> </ul>	<ul style="list-style-type: none"> <li>▪ No systematic compensation but recognition for some contributions</li> <li>▪ Various learning opportunities offered mainly by community</li> <li>▪ Various opportunities for networking, and helping others</li> </ul>

## Appendix B: Innovation Processes in Social Product Development

Figure B1 depicts a comprehensive process model for social product development. The SPD process starts when individual community members (actors) submit their original product concepts or ideas (*ideation*). The process continues as the community participates in initial screening (*community curation and co-evaluation*) and selection (*social voting*). Selected concepts are then internally reviewed by the innovation sponsor (*internal evaluation*) before going through the collaborative development phase. This phase may include prototyping and discussion with business partners (i.e., innovation partners) such as retailers and manufacturers and with expert consultants in different areas such as intellectual property, consumer product safety, and market research (*partner evaluation*). A handful of product concepts are chosen for further development, in which community members participate in feature selection, prototyping, and testing (*co-design and co-refinement*). Community members may participate in product monetization (*co-commercialization*). Finally, a fully developed product is manufactured (*manufacturing*) and launched through *indirect sales* by the innovation partner, or *direct sales* by the innovation sponsor. Revenues are distributed according to the platform’s business rules, with the member(s) who generated the idea (“ideators”) receiving the largest community share and those who help refine the product (“influencers”) receiving lesser percentages.

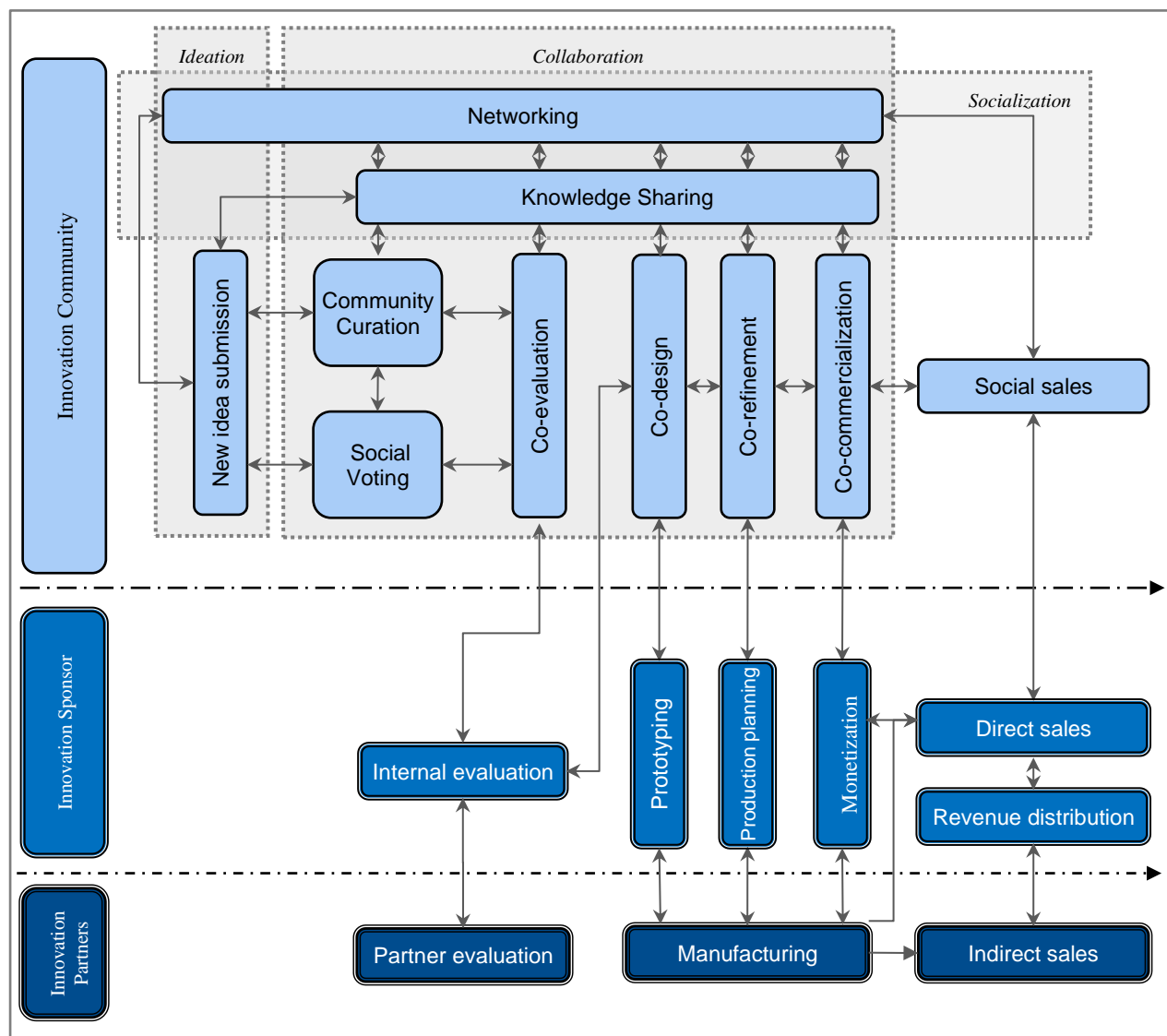


Figure B1. Social Product Development Innovation Processes (adapted from Abhari et al, 2020)

Our research focus is on what motivates and engages creative individual actors in an innovation community. In SPD innovation activities are interactive and community-oriented—for instance, community evaluation and voting for new ideas. Community members help each other out, learn from each other, solicit support for ideas or team members, and enjoy being part of the community. Participants can form teams and garner support for a new proposal using a variety of social platform features (e.g., creating user profiles; creating, viewing, and commenting on user content; liking and sharing; establishing network ties with other actors; searching for user profiles; and sharing portfolios). Sharing knowledge and opinions during product concept evaluation and selection activities involves mechanisms such as community voting and commenting on proposals. During the collaborative development phase, the innovation sponsor facilitates collaboration and connections between actors by offering features such as brainstorming tools, voting, messaging, and content-sharing. Collaboration continues during the commercialization phase that benefits from collaboration in market research, pricing, and branding and other post-launch activities such as sharing actors' contributions, promoting new products over social networks, soliciting consumer feedback, and celebrating community success (or learning from failures).

Despite the appeal of SPD as an OI model, platform sponsors have struggled to become economically viable. For instance, Quirky.com, declared bankruptcy in 2014, though it has since reemerged with a similar OI process and growing innovation community. Lack of demand for its products or its OI approach were not root causes. Instead, the firm experienced problems manufacturing and marketing at scale its increasingly complex and diverse products (Kohler & Nickel, 2017; Kwalwasser, 2015; M. Wu, 2017). Quirky now pursues licensing deals with third parties, instead of engaging directly in manufacturing and retailing (Key, 2017). This makes it even more essential for the platform to effectively engage community members in ideation, collaboration, and socialization to innovative new products and sustain the platform's viability, rather than depending on sales revenues of occasional breakthrough products.



## Appendix C

Table C1. Theorized Actor Goals in the SPD Context

Goals	Examples from studies of other oi models
<b>Monetary gain</b>	Financial compensation (Acar, 2019; Coelho et al., 2016; Fernandes & Remelhe, 2016; Füller, 2010; Mack & Landau, 2020) Reward (Antikainen et al., 2010; Battistella & Nonino, 2013; Frey et al., 2011) Free product/service (Battistella & Nonino, 2013)
<b>Recognition</b>	Recognition (Acar, 2019; Bretschneider et al., 2012) Reputation (Battistella & Nonino, 2013; Belenzon & Schankerman, 2015; Lakhani & Wolf, 2005; Mack & Landau, 2020; Oreg & Nov, 2008; Wasko & Faraj, 2005) Career benefits (Battistella & Nonino, 2013; Coelho et al., 2016; von Krogh et al., 2012) Enhancement of professional status (Antikainen et al., 2010) Personal profile development (Battistella & Nonino, 2013) Peer recognition (Antikainen et al., 2010; Wasko & Faraj, 2005) and firm recognition (Jeppesen & Frederiksen, 2006; Jeppesen & Laursen, 2007)
<b>Entrepreneurship</b>	Product improvement (dissatisfaction with current products) (Bretschneider et al., 2012; Mack & Landau, 2020; von Krogh et al., 2012) Develop new viewpoints/synergy (Antikainen et al., 2010) Entrepreneurship obligation (Antikainen et al., 2010; Antikainen & Vaataja, 2010; Lakhani & Wolf, 2005) Entrepreneurial development such as intellectual stimulations (Bretschneider et al., 2012; Ridings & Gefen, 2004) Curiosity (Füller, 2010; Mack & Landau, 2020) Own use (von Krogh et al., 2012) Efficacy as an entrepreneur (Antikainen et al., 2010; Füller, 2010; Li et al., 2012)
<b>Learning</b>	Self-development (Oreg & Nov, 2008) Learning (Acar, 2019; Battistella & Nonino, 2013; Benbya & Belbaly, 2010; Bretschneider et al., 2012; Fernandes & Remelhe, 2016; Mack & Landau, 2020) Information seeking (Füller, 2010; Ridings & Gefen, 2004) Skills development (Füller, 2010; Wiertz & de Ruyter, 2007)
<b>Socialization</b>	Expanded social network (Fernandes & Remelhe, 2016; Oishi et al., 2013) Community (Acar, 2019; Antikainen et al., 2010; Battistella & Nonino, 2013) Visibility (Füller, 2010) Reciprocity (Benbya & Belbaly, 2010) Social capital gain (Battistella & Nonino, 2013) Friendships (Füller, 2010; Ridings & Gefen, 2004) Relationships for social support (Ridings & Gefen, 2004)
<b>Altruism</b>	Altruism (Bretschneider et al., 2012; Oreg & Nov, 2008) Obligation-based goals such as meet morals/values (Li et al., 2012) Reciprocity (Belenzon & Schankerman, 2015) Knowledge-sharing (Coelho et al., 2016) Community support (Füller, 2010) Ideology (Battistella & Nonino, 2013; Nov, 2007) Prosocial (Acar, 2019) Social Responsibility (Battistella & Nonino, 2013)
<b>Enjoyment</b>	Enjoyment (Acar, 2019; Fernandes & Remelhe, 2016; Frey et al., 2011; Li et al., 2012; Oreg & Nov, 2008; von Hippel & Von Krogh, 2003) Interest (Mack & Landau, 2020) Play (Battistella & Nonino, 2013) Recreation /Hobby (Antikainen et al., 2010; Coelho et al., 2016) Entertainment (Antikainen et al., 2010; Battistella & Nonino, 2012; Bretschneider et al., 2012) Psychological compensation (Battistella & Nonino, 2013)

## Appendix D

**Table D1. Survey Instrument**

<b>Goals</b>		
<b>Extrinsic goals</b>	<b>Monetary gain (MNG)</b> (Frey et al., 2011; Li et al., 2012)	I contribute to Quirky because ... I receive money from my contributions to new product development. ... I receive purchase credit for Quirky product. ... I earn income through 'influencing' new product development. ... I am paid for my new product ideas.
	<b>Recognition (RCN)</b> (Li et al., 2012)	I contribute to Quirky because ... I gain reputation as a creative person. ... it helps me enhance my professional status. ... it increases the chance of being hired by building my professional status. ... I gain a reputation as an inventor.
<b>Internalized extrinsic goals</b>	<b>Entrepreneurship (ENT)</b> (newly developed)	I contribute to Quirky because ... I am curious about the process of new consumer product development. ... I am not satisfied with some existing consumer products in the market. ... I have creative product ideas that I want to introduce to others. ... I want to find solutions to unacknowledged consumers' needs.
	<b>Learning (LRN)</b> (Oreg & Nov, 2008)	I contribute to Quirky because ... it provides me with a means of developing my creative skills. ... it gives me an opportunity to learn new things about inventions. ... it helps me become better in product development. ... it helps me test my creativity.
<b>Internalized goals</b>	<b>Socialization (SCL)</b> (Oishi et al., 2013)	I contribute to Quirky because ... I make friends on this platform. ... I get in contact with like-minded people. ... I expand my social network. ... I am excited to meet new people.
	<b>Altruism (ALT)</b> (Bretschneider et al., 2012; Oreg & Nov, 2008; C.-G. Wu et al., 2007)	I contribute to Quirky because ... I enjoy helping others in their paths to success. ... I think this is a great opportunity to help the Quirky community. ... I want to contribute my share to consumer product development. ... I want to make my idea available to the community without expecting anything in return.
	<b>Enjoyment (ENJ)</b> Frey et al., 2011; Li et al., 2012)	I contribute to Quirky because ... it is fun. ... it is entertaining. ... it is enjoyable. ... it is fulfilling.
<b>Perceived participation affordances (Abhari et al., 2017)</b>		
<b>Platform ideation affordances (PIA)</b>		The platform enables me to ... submit new product ideas ... describe/present my product ideas ... monitor my idea evaluation process ... revise/resubmit my product ideas
<b>Platform collaboration affordances (PCA)</b>		The platform enables me to ... review different product ideas ... vote for different product ideas ... contribute to product design/development ... contribute to product commercialization
<b>Platform socialization affordances (PSA)</b>		The platform enables me to ... ... share my knowledge ... solicit votes/support ... discuss new ideas with community ... network with community
<b>Continuous intention (Bhattacharjee &amp; Premkumar, 2001; I. Y. L. Chen, 2007; Y. Zhang et al., 2010)</b>		

<p><b>Continuous intention to ideate (CII)</b></p>	<ul style="list-style-type: none"> <li>• I intend to continue to 'invent' (submitting new product ideas) with Quirky.</li> <li>• Even if I use alternative platforms, I will continue to 'invent' (submitting new product ideas) with Quirky.</li> <li>• I intend to discontinue submitting new product ideas to with Quirky.</li> <li>• I plan to submit more product ideas to Quirky in the near future.</li> </ul>
<p><b>Continuous intention to collaborate (CIC)</b></p>	<ul style="list-style-type: none"> <li>• I intend to continue 'influencing' new projects on Quirky (collaborating with other inventors).</li> <li>• Even if I use alternative platforms, I will continue influencing different projects on Quirky.</li> <li>• I intend to discontinue influencing new projects on Quirky (collaborating with other inventors).</li> <li>• I plan to influence more projects on Quirky in the near future (collaborating with other invent)</li> </ul>
<p><b>Continuous intention to socialize (CIS)</b></p>	<ul style="list-style-type: none"> <li>• I intend to continue socializing/communicating with Quirky members.</li> <li>• Even if I use alternative platforms, I will continue socializing/communicating with Quirky members.</li> <li>• I intend to discontinue socializing/communicating with Quirky members.</li> <li>• I plan to socializing/communicate with a greater number of Quirky members in the near future.</li> </ul>
<p><i>Note:</i> Actual contribution (AC) was measured objectively 30 days after the field survey by measuring the number of new concept ideas and successful influence on other projects submitted by the participating actors.</p>	

## Appendix E

Table E1. Factor Loadings

	ALT	CIC	CIS	CIH	ENJ	ENT	LRN	MNG	PCA	PSA	PIA	RCN	SCL
ALT1	<b>0.84</b>	0.37	0.57	0.33	0.54	0.32	0.38	0.12	0.21	0.42	0.31	0.19	0.47
ALT2	<b>0.9</b>	0.4	0.6	0.41	0.49	0.3	0.36	0.2	0.28	0.5	0.34	0.41	0.55
ALT3	<b>0.89</b>	0.34	0.55	0.34	0.51	0.3	0.37	0.19	0.28	0.49	0.31	0.29	0.49
ALT4	<b>0.47</b>	0.09	0.29	0.1	0.11	0.04	0.11	0.13	0.19	0.32	0.04	0.31	0.35
CIC1	0.37	<b>0.9</b>	0.48	0.68	0.41	0.43	0.56	0.3	0.52	0.38	0.51	0.35	0.27
CIC2	0.37	<b>0.87</b>	0.41	0.61	0.33	0.39	0.53	0.26	0.56	0.34	0.47	0.34	0.2
CIC3	0.19	<b>0.73</b>	0.28	0.57	0.34	0.34	0.38	0.19	0.4	0.16	0.37	0.11	0.01
CIC4	0.41	<b>0.87</b>	0.55	0.67	0.44	0.4	0.54	0.31	0.56	0.41	0.54	0.34	0.28
CIS1	0.63	0.48	<b>0.91</b>	0.47	0.51	0.24	0.4	0.17	0.38	0.61	0.4	0.3	0.64
CIS2	0.54	0.4	<b>0.89</b>	0.41	0.41	0.2	0.29	0.14	0.36	0.59	0.35	0.32	0.63
CIS3	0.43	0.39	<b>0.63</b>	0.44	0.38	0.17	0.23	0.05	0.21	0.38	0.3	0.14	0.33
CIS4	0.55	0.46	<b>0.87</b>	0.46	0.46	0.14	0.26	0.17	0.31	0.55	0.3	0.33	0.62
CIH1	0.4	0.72	0.44	<b>0.92</b>	0.42	0.5	0.48	0.46	0.43	0.34	0.6	0.45	0.24
CIH2	0.44	0.65	0.51	<b>0.87</b>	0.45	0.45	0.41	0.43	0.38	0.39	0.57	0.41	0.33
CIH3	0.18	0.54	0.4	<b>0.77</b>	0.35	0.25	0.31	0.3	0.31	0.19	0.45	0.29	0.15
CIH4	0.33	0.66	0.47	<b>0.89</b>	0.36	0.42	0.41	0.46	0.42	0.39	0.58	0.47	0.32
ENJ1	0.54	0.42	0.51	0.43	<b>0.95</b>	0.5	0.39	0.24	0.34	0.38	0.41	0.17	0.39
ENJ2	0.53	0.4	0.5	0.39	<b>0.95</b>	0.46	0.4	0.24	0.36	0.42	0.38	0.17	0.42
ENJ3	0.5	0.4	0.48	0.38	<b>0.95</b>	0.52	0.4	0.19	0.34	0.38	0.37	0.17	0.42
ENJ4	0.52	0.43	0.48	0.48	<b>0.86</b>	0.49	0.39	0.33	0.33	0.34	0.38	0.31	0.45
ENT1	0.29	0.47	0.22	0.48	0.53	<b>0.85</b>	0.56	0.27	0.37	0.18	0.41	0.29	0.16
ENT2	0.21	0.31	0.16	0.34	0.32	<b>0.72</b>	0.32	0.29	0.11	0.1	0.2	0.23	0.07
ENT3	0.27	0.34	0.18	0.35	0.39	<b>0.76</b>	0.43	0.16	0.26	0.23	0.4	0.27	0.12
ENT4	0.27	0.27	0.13	0.28	0.38	<b>0.81</b>	0.44	0.22	0.3	0.17	0.33	0.26	0.12
LRN1	0.4	0.58	0.32	0.49	0.4	0.5	<b>0.87</b>	0.33	0.46	0.29	0.44	0.51	0.36
LRN2	0.35	0.5	0.28	0.32	0.36	0.45	<b>0.83</b>	0.08	0.44	0.29	0.36	0.32	0.22
LRN3	0.24	0.44	0.25	0.34	0.29	0.5	<b>0.82</b>	0.14	0.45	0.31	0.37	0.4	0.21
LRN4	0.37	0.47	0.34	0.4	0.37	0.45	<b>0.82</b>	0.19	0.42	0.39	0.48	0.4	0.29
MNG1	0.17	0.29	0.11	0.43	0.26	0.31	0.22	<b>0.91</b>	0.15	0.06	0.34	0.33	0.18
MNG2	0.19	0.21	0.17	0.4	0.24	0.19	0.11	<b>0.81</b>	0.1	0.13	0.27	0.38	0.25
MNG3	0.2	0.33	0.17	0.45	0.24	0.3	0.27	<b>0.9</b>	0.17	0.1	0.35	0.39	0.23
MNG4	0.13	0.25	0.12	0.39	0.19	0.23	0.19	<b>0.84</b>	0.12	0.05	0.27	0.34	0.14
PCA1	0.3	0.52	0.32	0.37	0.35	0.29	0.51	0.09	<b>0.82</b>	0.42	0.55	0.18	0.24
PCA2	0.23	0.49	0.32	0.32	0.26	0.23	0.42	0.12	<b>0.84</b>	0.47	0.47	0.18	0.24
PCA3	0.22	0.56	0.29	0.41	0.34	0.38	0.47	0.16	<b>0.86</b>	0.4	0.5	0.24	0.15
PCA4	0.25	0.44	0.36	0.39	0.27	0.23	0.36	0.15	<b>0.81</b>	0.41	0.45	0.24	0.23
PSA1	0.44	0.32	0.58	0.31	0.34	0.13	0.32	0.06	0.51	<b>0.88</b>	0.37	0.24	0.47
PSA2	0.4	0.3	0.52	0.31	0.28	0.18	0.29	0.08	0.46	<b>0.87</b>	0.36	0.26	0.47
PSA3	0.55	0.4	0.57	0.4	0.4	0.25	0.36	0.16	0.43	<b>0.9</b>	0.44	0.32	0.53
PSA4	0.52	0.36	0.63	0.35	0.42	0.21	0.38	0.06	0.41	<b>0.89</b>	0.4	0.2	0.5
PIA1	0.34	0.61	0.39	0.66	0.43	0.45	0.52	0.4	0.55	0.42	<b>0.92</b>	0.32	0.22
PIA2	0.34	0.54	0.37	0.61	0.44	0.42	0.49	0.39	0.55	0.38	<b>0.93</b>	0.31	0.21
PIA3	0.24	0.38	0.32	0.47	0.23	0.25	0.3	0.22	0.5	0.36	<b>0.82</b>	0.32	0.2
PIA4	0.27	0.4	0.34	0.46	0.33	0.37	0.4	0.2	0.48	0.41	<b>0.84</b>	0.3	0.22
RCN1	0.39	0.41	0.29	0.47	0.22	0.4	0.49	0.39	0.23	0.26	0.35	<b>0.89</b>	0.43
RCN2	0.33	0.26	0.3	0.4	0.2	0.27	0.41	0.37	0.23	0.28	0.32	<b>0.9</b>	0.45
RCN3	0.28	0.25	0.26	0.39	0.16	0.19	0.39	0.39	0.22	0.24	0.29	<b>0.88</b>	0.44
RCN4	0.3	0.32	0.34	0.43	0.22	0.3	0.46	0.33	0.2	0.25	0.3	<b>0.89</b>	0.45
SCL1	0.57	0.26	0.61	0.32	0.4	0.13	0.27	0.27	0.17	0.51	0.22	0.49	<b>0.9</b>
SCL2	0.57	0.21	0.65	0.28	0.46	0.22	0.38	0.2	0.26	0.51	0.24	0.4	<b>0.89</b>
SCL3	0.46	0.2	0.56	0.26	0.34	0.09	0.24	0.22	0.22	0.47	0.19	0.49	<b>0.87</b>
SCL4	0.48	0.17	0.61	0.24	0.4	0.1	0.28	0.14	0.26	0.49	0.21	0.4	<b>0.89</b>



## Appendix F

**Table F1. Collinearity Statistics (Inner VIF Values)**

	<b>CII</b>	<b>CIC</b>	<b>CIS</b>
<b>ALT</b>	2.05	2.06	2.03
<b>ENJ</b>	2.13	2.14	2.1
<b>ENT</b>	1.94	1.96	1.92
<b>LRN</b>	2.19	2.19	2.16
<b>MNG</b>	1.37	1.37	1.37
<b>PCA</b>	1.95	1.98	1.94
<b>PIA</b>	2.00	2.02	1.98
<b>PSA</b>	2.09	2.09	2.09
<b>RCN</b>	1.93	1.94	1.92
<b>SCL</b>	2.32	2.32	2.29

## About the Authors

**Kaveh Abhari** is an associate professor of management information systems at Fowler College of Business at San Diego State University. He strives to make education, innovation, and entrepreneurship accessible to underserved and disadvantaged communities through humane digital transformation. His current research focuses on the applications of digital platforms in democratizing innovation. He also leads federally funded research projects on inclusive and alternative education models enabled by social technologies. Dr. Abhari is the founding director of the Digital Innovation Lab (DiLab) at San Diego State University and the STEM<sup>2</sup> R&D Group at the University of Hawai'i. His research has been published in journals such as *IEEE Transactions on Engineering Management*, *AIS Transactions on Human-Computer Interaction*, and *Internet Research*.

**Elizabeth Davidson** is the W. Ruel Johnson Professor of Information Technology Management at the Shidler College of Business, University of Hawai'i at Mānoa. In her research, she studies the adoption, assimilation, and use of information systems and technologies in organizations, focusing on healthcare settings such as small physician practices and communities. In other research streams, she has investigated sociocognitive processes in information systems development as well as the emergence of new actor types and innovation practices on social media platforms. Her recent studies have focused on the societal challenges and innovation opportunities posed by interorganizational data governance in the healthcare sector. Her research has been published in journals such as *MIS Quarterly*, *Information Systems Research*, *Journal of Management Information Systems*, *European Journal of Information Systems*, *Journal of the Association for Information Systems*, and *Information and Organization*. Dr. Davidson has served as an associate or senior editor for *MIS Quarterly*, *Journal of the Association for Information Systems*, and *European Journal of Information Systems*, and as the editor-in-chief for *Information and Organization*.

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