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The dynamics of innovation contest experience: An integrated framework from the customer's perspective☆

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ABSTRACT

Getting customers to actively participate in company-sponsored innovation contests is increasingly crucial. While much of the extant research on innovation contests is understandably focused on company benefits, relatively less is known about the innovation contest experience (ICE) from a customer perspective. This research extends the innovation contest literature by developing an integrated framework for evaluating contest experiences. Based on a mixed method approach, this study investigates the role of an understudied variable, namely perceived challenge (PC) of the innovation task, and its influence on ICE. Results indicate that PC has a direct positive (quadratic) influence on ICE, that PC negatively moderates the effect of extrinsic motivation on ICE as well as the effect of intrinsic motivation on ICE. This study also reveals an interaction effect between extrinsic and intrinsic motivation, showing a moderating effect of extrinsic motivation on the link between intrinsic motivation and ICE. Both short-term and long-term outcomes of ICE are modeled and tested. Results indicate that a positive ICE leads to a greater customer willingness to participate in subsequent contests and to an enhanced company reputation for innovation.

1. Introduction

Customer participation in innovation contests is an increasingly common new product development (NPD) tool that allows innovation-oriented companies to actively interact with customers. Some estimates indicate that innovation contests held on crowdsourcing platforms have grown by 48% since 2015[1] and the NPD field has witnessed a sharp increase in both academic and practitioner interest in the topic of tapping into crowd knowledge to find new ideas (Agrawal, Catalini, & Goldfarb, 2014; Bogers, Afuah, & Bastian, 2010; Boudreau & Lakhani, 2013; Ramaswamy & Ozcan, 2018). While the field has amassed substantial knowledge regarding the *company* benefits of crowdsourcing activities (Allen, Chandrasekaran, & Basuroy, 2017), relatively less is known about what attracts or retains participants in innovation contest experiences (ICE) from the *customer* perspective.

Customer participation in innovation contests is crucial as significant contributions to the NPD process occur only when talented people are willing to share their creative ideas (Garcia Martinez, 2015; Gebauer, Füller, & Pezzei, 2013; Nishikawa, Schreier, & Ogawa, 2013). Furthermore, despite the substantive knowledge gains, some scholars claim that research on innovation contests from a customer perspective would benefit from both a stronger theoretical motivation (Allen et al., 2017; Fang, Palmatier, & Evans, 2008; Nishikawa et al., 2013) and a better knowledge of company-customer integration (Cui and Wu, 2016). An understanding of the drivers of a compelling and enjoyable innovation contest experience is still lacking (Nambisan & Nambisan, 2008; Prahalad & Ramaswamy, 2003) and a deeper examination into customer psychology might help reveal the motivation of customer participation in innovation contests. Uncovering successful methods of attracting customers to participate in innovation contests is important for both scholars and managers alike and is a primary goal of the present research.

To be successful, innovation contests need to attract a large number of participants. Diverse rewards and compelling experiences compete for an individual's time and attention – both increasingly limited resources (Wang, Butler, & Ren, 2013). While these incentives can be

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[1] 2017 State of Crowdsourcing Report - *Welcome to the Age of Ideation* (edited by eYeka's CEO F. Petavy)

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extrinsic or intrinsic in nature, many crowdsourcing platforms base their reward structure on offering extrinsic, monetary rewards. (e.g., eYeka, Innocentive). Yet, the demonstrated effect of using extrinsic incentives is mixed with some research even showing that extrinsic motivation can have a detrimental effect on both intrinsic motivation and creativity (Byron & Khazanchi, 2012; Deci, Koestner, & Ryan, 1999). While the use of intrinsic incentives has been demonstrated to elicit enjoyable customer experiences, this usage is relatively under-investigated relative to extrinsic motivations (Füller, 2010).

Extant knowledge begs the research questions of what are the antecedents that draw customers to participate in innovation contests and what are the outcomes of a productive experience? Building on principles from flow theory and the self-determination literature, the present research seeks to improve our understanding of the antecedents of the innovation contest experience (ICE) from a customer perspective. A *positive* ICE (which is the focal interest of this research) refers to an experience by which people performing a task feel joy and engagement while participating in the contest (Gebauer et al., 2013; Kohler, Fueller, Matzler, & Stieger, 2011). A second goal of this research is to augment our knowledge regarding the short- and long-term outcomes of ICE while also providing managers with actionable insights for enhancing ICE in order to attract greater numbers of individuals to the experience.

The present study proposes to contribute to the literature in three important ways. First, this study provides an integrative framework for a refined understanding of ICE through the identification and testing of contest antecedents (including both internal and external motivations) in addition to outcomes such as willingness to participate (short-term) and reputation for product innovation (long-term). Second, we propose and test (for the first time in an innovation contest setting) that an individual's perceived challenge of the innovation task has a positive quadratic effect on ICE. We further empirically demonstrate that the perceived challenge negatively moderates the positive relationship between both extrinsic and intrinsic motivations and ICE. Third, this study adds evidence supporting the existence of an interaction effect between extrinsic and intrinsic motivational factors. It thus extends self-determination research by showing a "crowding-out" (detrimental) effect exerted by extrinsic motivation on intrinsic motivation.

In the following sections, the authors present the conceptual framework that motivates the present study. Hypotheses detailing the antecedents and outcomes of ICE are then presented. The mixed method analytical methodological approach is then presented. The manuscript concludes with a presentation of the results as well as study implications and limitations.

2. Theoretical framework

2.1. Innovation contests

Today, innovation contests have expanded dramatically due to online platforms that have fostered the participation of online communities in the NPD process (Wooten & Ulrich, 2017). Online innovation contests represent a relatively new form of inbound open innovation and companies can now leverage crowdsourcing platforms to benefit from a broader user community (Chua, Roth, & Lemoine, 2014; Gruner, Homburg, & Lukas, 2014; Terwiesch & Xu, 2008). An innovation contest is defined here as a web based competition of individuals who use their skills, experience, and creativity to provide a solution for a particular contest challenge as defined by an event organizer (Bullinger, Neyer, Rass, & Moeslein, 2010).

Extant research in this vein is instructive, yet centers largely on more conceptual, broader level aspects of the contest in contrast to the contest experience itself. Research dedicated to innovation contests largely focuses on the determinants of contest success with a general focus on either the nature of the incentives (Boudreau, Lacetera, & Lakhani, 2011), the design of the competition (cooperation or competition or mixed approach) (Bullinger et al., 2010; Hutter, Hautz, Füller, Mueller, & Matzler, 2011), the governance structure (Felin & Zenger, 2014), the design principles for virtual co-creation systems (Kohler et al., 2011), or the participants' characteristics (Faullant, Holzmann, & Schwarz, 2016; Poetz & Schreier, 2012).

This latter stream of research indicates that *non-expert* participation (i.e., customers) in innovation contests can help companies to quickly brainstorm new product solutions that correspond to customers' unmet needs (Poetz & Schreier, 2012). It also reveals that both the diversity of contributors as well as their level of expertise and professionalism leads to an increased quality of submitted designs (Füller, Hutter, Hautz, & Matzler, 2017). Additional studies demonstrate the influence of the number of participants, the participant intensity, as well as the presence of high-ranking participants on the success of innovation contests (Boudreau et al., 2011; Camacho, Nam, Kannan, & Stremersch, 2019; Girotra, Terwiesch, & Ulrich, 2010).

Within this stream of research dedicated to participants' characteristics, other studies focus on the nature of feedback and rewards (monetary, non-monetary, or mixed) and their influences on motivations to contribute to innovation contests (Piller & Walcher, 2006; Salgado & De Barnier, 2016; Terwiesch & Xu, 2008). Wooten and Ulrich (2017) find contrasting results for three types of feedback (i.e., no feedback, directed feedback, and random feedback) on outcomes such as idea quality and individual participation. Füller (2010) went further, investigating the various nature of individual motivations to participate in innovation contests, distinguishing four different consumer types (reward oriented, need driven, curiosity driven, and intrinsically interested). Some research also suggests the importance of social dimension, collaboration, and a sense of community on individual contest experiences (Füller, Hutter, & Faullant, 2011).

While providing valuable insights on the nature of participants, extant research fails to develop a theoretical framework to better understand the effects of customer motivation on ICE. The present study is aligned with "new idea generation" competition as characterized by a taxonomy of crowdsourcing based on task characteristics (Nakatsu, Grossman, & Iacovou, 2014). This approach is considered by many scholars as a promising research avenue as the ideation stage is considered the most critical for NPD success (Allen et al., 2017; Ghezzi, Gabelloni, Martini, Natalicchio, & Di Bari, 2017; Nishikawa et al., 2013; Poetz & Schreier, 2012). Research remains limited regarding the study of competition design characteristics as drivers of creativity in innovation contests (Piller & Walcher, 2006). While the use of innovation contests as a useful driver of product development is taken as a given here, a theoretical framework is still missing and an examination of the antecedents and consequences of contest experience from a customer perspective is warranted.

2.2. Flow theory and self-determination

The concept of *flow* is derived from flow theory (Csikszentmihalyi, 1975) and is defined as deeply engaging in an activity that is intrinsically enjoyable to the individual. Being "in flow" is generally described by engaged individuals as a pleasurable experience such that the activity is generally perceived to be worth doing for its own sake (Nakamura & Csikszentmihalyi, 2014). In essence, the intrinsic experience in and of itself becomes its own reward. In an innovation contest scenario, a customer who would be classified as in flow would derive deep satisfaction from the interpersonal interaction with a company during the NPD process. No explicit reward need to be present for someone to be in a state of flow. According to Csikszentmihalyi (1975), users are more inclined to be involved in a venture if they perceive the proposed task as intrinsically interesting, stimulating, and presenting a real challenge. Perceived challenge is an important concept in flow theory. A state of flow provokes a sense of joy, satisfaction, and playfulness in an individual, which are fundamental aspects that characterize an optimal experience (Csikszentmihalyi, 1988). This playfulness corresponds to an intrinsic pleasure felt during the

Table 1
Summary of innovation contest empirical research and customers' motivation to participate.

	Domain	Motivational component included	Methodology	Dependent variable	Mediating moderating variable	Sample description	Findings
Roberts, Hann, and Slaughter (2006)	Open source software (OSS)	Intrinsic, extrinsic, status, use-value	Structural equation model (Lisrel)	Participation, performance	Intrinsic, status, use-value	Apache contributors n = 288	Extrinsic motives do not diminish intrinsic, contrasting effect of intrinsic motives, use-value and status
Nambisan and Baron (2009)	Virtual customer integration	Community, self-image, expertise, company partnership	Structural equation model (PLS)	Contribution to community, Contribution to company	Identification with company, community	IBM and Microsoft customer forums n = 152	External rewards have an impact on contribution to company (ideation)
Füller (2010)	Ideation contest	Reward, intrinsic, curiosity, need driven participant	Survey	Expectation toward participation	None	12 ideation contests n = 727	High interest of intrinsically and reward-oriented participant
Zheng, Li, and Hou (2011)	Ideation contest	Intrinsic and extrinsic motivation	Structural equation model (PLS)	Participation	Participation intention	Contest solvers from tasckcn n = 283	Strong evidence of the effects of intrinsic motivation, contrasted effect of extrinsic motivation
Frey, Lüthje, and Haag (2011)	Ideation contest	Extrinsic, intrinsic, knowledge	Structural equation model (PLS) and contend analysis of postings	Substantial contribution	None	Atizo community n = 104	Intrinsic motivation explains activity and quality
Von Krogh et al. (2012)	Open source software (OSS)	Extrinsic, Intrinsic, Internalized extrinsic motivations	Meta-analysis	None	None	Literature review on motivation in OSS	Contrasting effect of reward on participation. Accumulated knowledge leads to more challenging tasks seeking
Garcia Martinez (2017)	Predictive modelling and analytics competition	Intrinsic motivation	Structural equation model (Lisrel)	Quality of ideas Number of competitions	Participation intention	Secondary data from Kaggle and survey n = 222	Intrinsic motivation exerts a strong effect on participation intention and creative effort. Highly autonomous competitions demanding skills lead to greater enjoyment and sense of competence.

experience. It exceeds any extrinsic motivation to reach some form of self-enrichment through research and achievement of new goals.

A related topic is the concept of self-determination. This concept is derived from self determination theory (Deci & Ryan, 1985) and stipulates that individuals evaluate to what extent the execution of a particular task meets their basic psychological needs. Self-determination theory (SDT) identifies three basic psychological needs - autonomy, competence, and relatedness – that represent essential, universal, and innate "nutriments" that, when satisfied authentically, lead to psychological health and the development of intrinsic motivation (Deci & Ryan, 1985; Ryan & Deci, 2001). SDT is particularly suited for tasks in which is an externally motivated activity requires internalization to initiate and sustain action. The theory pays special attention to contextual factors such as external rewards, punishment, and task difficulty. These contextual factors are shown to have a substantial impact on crowdsourcing activities (i.e., customer participation in innovation contest) and, in certain cases, harming the perceived autonomy and intrinsic motivation of individuals.

2.3. Intrinsic and extrinsic motivation

When dealing with antecedents of ICE, individual motivation is critical as customer participation in such opportunities is often solely based on voluntary behavior. In line with convention, we define individual motivation as being influenced by either intrinsic factors (i.e., fun, kinship, altruism, curiosity) or extrinsic factors (i.e., payment, career prospects, reputation) (Füller, 2010; Kristensson, Gustafsson, & Archer, 2003; Moneta & Csikszentmihalyi, 1996; Stock, Oliveira, & Von Hippel, 2014).

Intrinsic motivation can be defined as doing an activity for the inherent satisfaction and enjoyment of the experience (Miller, Deci, & Ryan, 1988; Ryan & Deci, 2000a). Play, fun, and entertainment are noted sources of intrinsic value (Holbrook, 2001) and task enjoyment is known to be a key feature of creative experience enabling individuals to reach a higher level of creativity (Dahl & Moreau, 2007). In a contest setting, it can correspond to an intrinsic interest that individuals feel while developing creative solutions (Amabile, 1996). As people derive "high play (i.e., recreational) value" from enjoyable experiences, they often try to maintain a similar state of pleasure in the contest (Mathwick & Rigdon, 2004). Intrinsically motivated individuals are shown to prefer experiential-oriented behaviors (Hoffman & Novak, 1996), seeking out enjoyable recreation activities and experiences (Füller, 2006, 2010).

Extrinsic motivation is a construct that pertains whenever an activity is done in order to attain some separable outcome (Ryan & Deci, 2000b). It relates to activities that are not an end per se, but that serve to satisfy general needs through the associated incomes. Pure extrinsic motives (such as payment, career prospects, reputation, or other gains) and internalized extrinsic motives (such as learning, gaining insights and use of one's own ideas and innovations) are known to play a substantial role in the motivation to participate in innovation contest ventures (Füller, 2010). One leading extrinsic motivation that has an impact on participation is the recognition by peers (Lakhani & Von Hippel, 2003; West & Gallagher, 2006). Other factors, such as the desire to satisfy personal needs (Franke & Von Hippel, 2003, Lakhani & Von Hippel, 2003; West & Gallagher, 2006) and social motivations oriented towards others such as altruism and reciprocity (Füller, 2010) are detailed in the literature.

The interaction of both intrinsic and extrinsic motivations has drawn the research attention of many scholars and evidences competing effects on behavior. In the context of a purely intrinsically motivated task (i.e. creative task in innovation contests), rewards, feedbacks, or expected outputs (considered as extrinsic rewards) have negative effects on intrinsic motivation (Deci, 1975; Miller et al., 1988). Conversely, an extrinsically motivated task can have an initial negative effect with an eventual positive effect on intrinsic motivation (Deci,

Ryan, & Koestner, 1999). According to SDT, this U-shaped effect might be explained by a potential controlling or restrictive perception effect by the focal recipient. In that vein, Deci and Ryan (1985) distinguish between two extrinsic motivators, "informational" or "controlling", which result in detrimental (crowding-out) or beneficial (crowding-in) effect on intrinsic motivation (Gagné & Deci, 2005). Informational factors such as reputation incentives, positive feedback, knowledge, or external rewards can reinforce a sense of competence and therefore foster greater involvement in an activity (Salgado & De Barnier, 2016). However, controlling incentives (money, gifts, career promotion) can diminish one's sense of autonomy thereby confining self-determination and reducing intrinsic motivation. In some cases, extrinsic motivators have conflicting effects, with some individuals interpreting them as controlling whereas others interpret them as informational (Deci et al., 1999) .

While extant literature reports that a combination of extrinsic and intrinsic motives normally moves customers to participate in innovation contests (see Table 1 for selective literature review), we know much less about: (1) the interaction effect between extrinsic and intrinsic motivational factors; (2) the influence of the perceived challenge of the contest on individual motivations and on ICE; and (3) the influence of those motivations on short-term and long-term effects such as willingness to participate (short-term) and reputation for product innovation (long-term) from the customer's point of view.

Fig. 1 details the conceptual model of the proposed antecedents and outcomes of ICE. The model is not intended as exhaustive, but rather as a framework for making an initial inquiry into the dynamics of ICE from a customer perspective. In the following section, the authors present the study hypotheses, which are also denoted in Fig. 1. This is followed by the methodological approach and the study results.

3. Hypotheses

3.1. ICE antecedents

According to research on flow, the perceived challenge of an activity is one of the key determinants of the experience an individual derives from an activity (Csikszentmihalyi, 1975) as "the best moments usually occur when a person's body or mind is stretched to its limits in a voluntary effort to accomplish something difficult or worthwhile" (Csikszentmihalyi, 1990, p.3). Desire for challenge is also found to facilitate intrinsic motivation in the self-determination literature (Ryan & Deci, 2000b, 2000a). Yet to our knowledge, perceived challenge has not been investigated in a NPD or innovation contest setting.

Kohler et al., 2011 identified that one of the major personal drivers for participation in an innovation contest is the desire to engage in a challenging task. Participating in an innovation contest with an appropriate level of challenge is a strong motivator for individuals seeking to improve their skills (Dahl & Moreau, 2007). In this context, a strong perceived challenge should lead to increased persistence and interest in innovation contest activities (Csikszentmihalyi, 1990), which is considered an essential prerequisite for creative input and promising solutions (Csikszentmihalyi, 1990; Dahl & Moreau, 2007). Research also indicates that the greater the complexity of challenges, the greater the individual's enjoyment (Nambisan & Baron, 2009). Perceived challenge leads to state of enjoyment and concentration called optimal flow (Ghani and Deshpande, 1994). A high level of challenge can trigger more active participation since it increases intrinsic motivation through a higher level of excitation (Moneta & Csikszentmihalyi, 1996).

Yet, flow occurs when users perceive opportunities or challenges that are matched with their own capacities or skills (Hoffman & Novak, 1996). Challenges that are beyond the capabilities of an individual will conversely not lead to a state of flow. A challenge must produce "playfulness"(Csikszentmihalyi, 1990; Moneta & Csikszentmihalyi, 1996) and be difficult enough (but not overly difficult) to be perceived as challenging in order to evoke enjoyment (Mathwick & Rigdon, 2004). A high level of playfulness will thus only be achieved if the individual is able to perceive a *realistic* level of challenge. If the challenge is too easy, participants will become bored. Likewise, an overly difficult challenge is likely to dampen customer enthusiasm for an innovation contest (Mathwick & Rigdon, 2004). The flow state has a strong functional aspect, in that individuals experiencing flow are highly concentrated and optimally challenged while being in control of the action (Mathwick & Rigdon, 2004). Too little or too much perceived challenge can produce adverse effects. We therefore posit:

H1: Perceived challenge has a positive (quadratic) effect on ICE.

The direct, positive impact of extrinsic motivation (EM) and intrinsic motivation (IM) on perceptions of ICE is well documented (see Table 1). As such, we will not reiterate here the arguments detailing the relationships between EM and IM on ICE. Cognitive theories suggest however that activities must be optimally challenging to be motivating (Deci, 1975). Individuals seek out activities that satisfy their needs for feeling competent and self-determined. According to self-determination theory, competence is a key to motivation (Ryan & Deci, 2000b). It is all the more important for creative experience as competence, defined as anticipated satisfaction derived from completing a creative project successfully, is a basic motivation for undertaking creative task (Dahl & Moreau, 2007).

Yet, the task difficulty has an influence on the perceived competence and motivation of the individuals. Perceived challenge and perceived competence evolve in the same direction until a certain threshold. Because the target outcome could be made more or less difficult to achieve, its effect on the satisfaction derived from successfully completing a creative task (perceived competence) would depend

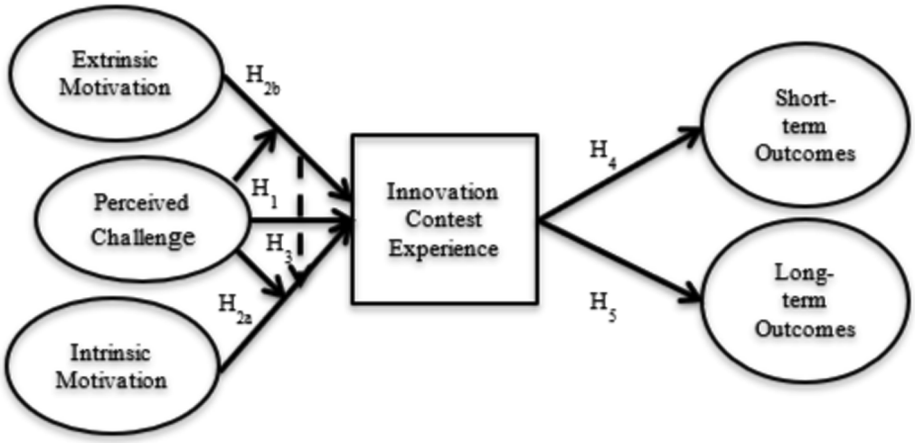


Fig. 1. Conceptual Model of Antecedents and Consequences of the Innovation Contest Experience.

on the level of difficulty presented by the task (perceived challenge) (Dahl & Moreau, 2007). A high level of perceived challenge also requires acquisition of new knowledge to be able to meet the challenge (internalized extrinsic motivation) while collecting more information about the company and its activities. Non optimal and too complex challenges thus result in a diminution of perceived competence, a lack of initiatives, autonomy and distress (Ryan & Deci, 2000b). If people do not believe they can accomplish a task, their motivation tends to suffer (Grant & Dweck, 2003). The authors therefore expect an individual's perceived challenge of a NPD task to negatively moderate the relationship between both extrinsic and intrinsic motivation and ICE. We therefore posit:

H2a: PC negatively moderates the effect of IM on ICE.

H2b: PC negatively moderates the effect of EM on ICE.

A dynamic relationship between intrinsic and extrinsic motivations is observed in the literature on motivational models and empirical evidence is mixed. For example, a "crowding-out" (i.e., detrimental) effect is evidenced in some research where extrinsic rewards were introduced in creative settings that were, arguably, mostly intrinsic-oriented environments (Deci, 1971; Frey & Oberholzer-Gee, 1997). It is also observed that if extrinsic motivations are perceived as controlling on the part of the sponsoring company, intrinsic motivation is diminished (Gagné & Deci, 2005). Paradoxically, this negative interaction can decrease and also be positive in cases where behavior is not purely intrinsic (Amabile, 1993). On one hand, rewards, feedback, recognition, and money (which are the dominant incentives proposed in innovation contests) can increase the perception of being controlled by either a crowdsourcing platform or the sponsor company. Thus, the feeling of autonomy is reduced by the expectancy that a new idea must be delivered within a certain time frame in order to receive monetary compensation. This perceived situation can be counterproductive for an individual's intrinsic motivation (Deci & Ryan, 1985, 2002). On the other hand, extrinsic motivation that is viewed as informational (e.g., feedback, recognition or praise) underscores a participant's competence and helps foster intrinsic motivation (Amabile, 1993; Deci et al., 1999).

In some circumstances, extrinsic incentives have been shown to have contrasting effects, whereby some consider them as controlling while others view them as informational (Amabile, 1993; Deci et al., 1999), which further adds to the mixed extant results. In the present study, ICE takes place in online community where participation is expected within a volunteer behavior. As evidenced in the Open Source Software literature, community members find motivation from the incentives offered by the platform (Von Krogh, Haefliger, Spaeth, & Wallin, 2012). Introducing purely extrinsic rewards such as monetary incentives in those communities might be viewed as controlling rather than informational. Furthermore, literature dedicated to crowdsourcing contests shows that external incentives weaken the impact of intrinsic motivation on task effort (Liang, Wang, Wang, & Xue, 2018). Therefore, the following interaction effect between intrinsic and extrinsic motivation is hypothesized:

H3: Extrinsic Motivation negatively moderates the effect of Intrinsic Motivation on ICE (crowding out effect).

3.2. ICE outcomes

While the driving interest in this research is to better understand the antecedents of ICE and how to attract individuals to them, uncovering novel ICE outcomes in a NPD setting are also important to scholars and managers alike. Several consequences of contests have already been identified in the literature. For example, a contest leads to more innovative ideas (Füller, 2010), increased word of mouth activity (Gebauer et al., 2013; Nambisan & Baron, 2009), greater willingness to pay (Gebauer et al., 2013), higher quantity and quality of submitted designs (Girotra et al., 2010), as well as greater brand loyalty (Füller, 2010). Here, the focus is on both short-term and long-term outcomes. To address short-term outcomes, the authors measure willingness to participate in subsequent contest ventures whereas evaluations of a company's reputation for product innovation are used to measure long-term outcomes.

Despite its crucial role, empirical studies on ICE outcomes are relatively scarce (Carbonell, Rodríguez-Escudero, & Pujari, 2009) and limited attention has been paid to outcomes from a customer point of view. Extant research largely regards contests from efficiency gains for companies: faster speed to market (Alam, 2002), reduce failure risk (Hoyer, Chandy, Dorotic, Krafft, & Singh, 2010), and minimization of new products and services development costs (Rindfleisch & O'Hern, 2009). When the experience is rewarding and valuable, customers are likely to replicate such experiences. If the results of these creative experiences are positive, the participants will be motivated to participate again in future innovation competitions. Conversely, past failures or unpleasant experiences will lead customers to reject future participation (Miller et al., 1988; Ryan & Deci, 2000a). This logic is also noted in customer satisfaction research as a positive experience with a product or a service is perceived as a necessary condition for maintaining the relationship between the customer and the firm (Mittal and Kamakura, 2001) . In addition, an activity that is joyful and provides playfulness is deemed valuable (Deci and Ryan, 1985). These activities lead to an enjoyable state of mind that individuals seek to reproduce. It is ultimately the quality of the lived experience that allows the individual to continue along this path and feel motivated. Customers interested in innovation contests not only seek to express their creativity, but also seek to engage in other contest tasks such as commenting, voting, or word-of-mouth activity (Fuchs & Schreier, 2011). We therefore posit:

H4: ICE positively affects individual's willingness to participate in subsequent innovation contests.

A compelling experience fosters interactivity between community members and the sponsoring company and positively affects participants' attitudes towards contests (Hoffman & Novak, 1996, 2009). Increasing a customer's willingness to participate in subsequent innovation ventures is of obvious short-term benefit to an innovating company for the myriad of reasons previously discussed. Yet, the potential longer-term reputational effects are also interesting to explore. The service science literature (notably literature on co-production) concludes that the engagement of individuals in the co-production process not only fosters their positive evaluation of the self-produced product (Troye & Supphellen, 2012) but also modifies their attitudes toward the company that provided the co-production (Bendapudi & Leone, 2003). In that vein, the authors posit that longer term customer-company relationships are affected by the contest process. Prior research shows that a favorable participation experience has a positive impact on how individuals perceive a firm's corporate image. For example, they are viewed as more customer-oriented and more innovative (Fuchs, Prandelli, & Schreier, 2010). This creates a positive predisposition toward the sponsoring company. Similarly, Mathwick and Rigdon (2004) show a positive influence of a playful experience on an individual's overall attitude toward the company.

The authors propose that corporate reputation for innovation is an important variable to study as many companies seek to publicly promote an innovative firm perception. The underlying rationale is that reputation is an intangible asset that takes time to create and leads to many critical outcomes such as overall company image, propensity to pay a premium price, or loyalty to the firm (Salgado & De Barnier, 2016). Hence, companies that are involved in innovation contests are arguably perceived by both participant and non-participants as more innovative than other firms. Salgado and De Barnier (2016) define reputation for product innovation (RPI) as an individual's perception of a firm's track record of product innovations, degree of creativity, and potential for continued innovative activity in the future. They indicate that a high customer perceived RPI can lead to excitement toward, and heightened loyalty to, the innovative firm. While these, and other, outcomes are arguably beneficial to companies, the perceptions are customer generated and flow from the customers' level of involvement

and interaction with a company. These are positive outcomes in a contest environment as customers are more likely to be attracted to companies they view as innovative. The RPI construct takes into account an individual's perceptions, experiences, and expectations of a firm's product innovativeness (Weigelt & Camerer, 1988). It seems logical that participation in a call for innovation contest impacts the reputation of the firm in its ability to launch new products or to be creative. In that context, individual participants have to learn about the product category and grasp information about the company, all while enriching their brand knowledge and discovering new usages associated to the products. Given this, we posit:

H5: ICE positively affects individual's perception of a company's RPI.

4. Methodology

4.1. Sample population and data collection

Consistent with the pursuit of theory building (Edmondson & Mcmanus, 2007), the authors used a mixed method analytical approach integrating both qualitative and quantitative data. The mixed method approach was chosen since it increases the confidence interpretations' plausibility (Edmondson & Mcmanus, 2007) and provides stronger inferences and insights. The present research design is comprised of three studies – one qualitative and two quantitative. Both the qualitative and quantitative data were sourced via real-world Agorize crowdsourcing campaigns. Agorize is a global leader in company sponsored innovation communities connecting a global host of individuals with a diverse range of international companies including Microsoft, Uber, Allianz, and Accenture.

To test the study hypotheses, the present research was organized into two distinct quantitative analyses, with increasing complexity from Study 1 to Study 2. Study 1 subjects were comprised of 110 engineering graduate students from a leading European university (10.5% female; mean age = 21.7). Their contest task was to design the "scooter of the future" in conjunction with the firm Piaggio (i.e., Vespa scooters). This Agorize campaign was an innovation contest and interaction with representatives from the sponsoring company was somewhat limited given the "challenge" nature of the campaign. Participants were given baseline information about the popular Vespa product line but were charged with designing an innovative product for future buyers and markets (i.e., re-imagining of the brand and/or category). Participants were urged to complete an online survey, which remained active for a 6-week period. Of the 113 questionnaires collected from this sample, three were removed due to missing data fields (97.3% response rate).

As an added measure to better understand the dimensions at stake in an innovation contest experience, the authors also conducted 19 semi-structured qualitative interviews with subjects from Study 1. The interview guide involved open-ended, non-directive questions. Following the commonly accepted constant comparison method for qualitative inquiry (Spiggle, 1994; Strauss & Corbin, 1998), data analysis was an ongoing and iterative process that gradually evolved throughout the data collection phase. The average duration of each interview was 60 min and each was recorded and later transcribed. Two of the authors independently analyzed the transcripts in search of recurrent themes or patterns (Spiggle, 1994) via categorization, abstraction, comparison, integration, and iteration. The authors employed the qualitative software Nvivo 9 and coded 600 text passages that were then allocated to 25 categories, which addressed a common theme (Spiggle, 1994).

The two authors' coding sheets were then jointly reviewed and assessed for congruency. Initial inter-coder reliability was high (76%) and differences in independent coding were subsequently rectified by discussion. Results confirmed the dimensions observed in literature with regard to individual's motivation to participate in innovation contests ventures (i.e., hedonic, utilitarian, time perception, social interactions) (Kohler, Fueller, Stieger, & Matzler, 2011; Nambisan & Baron, 2009). The results of this qualitative study also confirmed the flow theory supposition that interactions between individuals and companies were dependent upon the symbiosis of challenge and skills. Multiple respondents mentioned, in retrospect, that they were not skilled enough to handle the difficulty of the tasks offered by the innovation challenge, which led to perceptions of a diminished personal experience (see Appendix A for representative quotes).

With the results from Study 1 and the complementary qualitative insights completed, the authors conducted a second study, which was an Agorize campaign where engineers, lawyers, designers, architects, and managers from around the world were tasked with developing "new uses for tires" in concert with Michelin representatives. The second sample was comprised of 134 active Agorize members (35.1% female; mean age = 22.7) who participated in three contests phases. Phase one involved the submission and selection of ideas. Phase two involved Michelin selecting the top ideas and assigning a corporate representative to each team while phase three had the finalists and their mentors jointly presenting their ideas to the Michelin board. Given the importance of the hypothesized impact of perceived challenge in our model, measuring an individual's perception of their competence on the contest task is warranted[2]. Given that model 1 utilized student subjects (i.e., non-expertise), a measure of each participant's expertise was included in model 2 only. For Study 2, 471 participants were sent questionnaires of which 136 responses were received. Two surveys were removed due to invalid responses, resulting in a final subject population of 134 (28.5% response rate). Study 2 design replicated the first study, yet with actual customers to further improve the external validity of the first study's findings. To address non-response bias in both studies, the authors used the common procedure comparing early versus late responses (Armstrong & Overton, 1977) and found no evidence of differences between the two samples[3]. One can therefore conclude that non-response bias is not a concern in these studies. To further test for cross-sample differences, the authors conducted an ANOVA, which revealed no statistically significant differences between the two samples; thus, underscoring the validity of the present samples.

4.2. Measures and analysis

Partial least squares structural equation modeling (PLS-SEM) was used to estimate the conceptual model and test the hypotheses using XL-STAT (Hair, Hult, Ringle, Sarstedt, & Thiele, 2017). PLS-SEM, a variance-based methodology, is the most appropriate technique for the present study (versus a covariance method) for three main reasons. First, it can be applied to explore a structural model with emergent theoretical foundations. Specifically, it is suitable for data analysis during the early stage of theory development (Tsang, 2002). Both innovation contest experience (ICE) and perceived challenge (PC) are arguably in the early stages of scholarly examination. Second, PLS-SEM is a causal predictive method that underscores prediction in estimating statistical model, the causal explanation of motivations on ICE moderated by PC is a major objective of this study (Hair, Risher, Sarstedt, & Ringle, 2019b). Third, when models are complex with many constructs and relations (e.g. moderation), with medium sample size and non-linear relations, PLS-SEM is recommended for higher statistical power in path estimation (Hair et al., 2019c; Hair, Ringle, et al., 2019a; Hair, Risher, et al., 2019b). All indicators were mean-centered and standardized to facilitate interpretation of their effects and statistical significance of the parameters was assessed through bootstrapping (Chin & Dibbern, 2010).

Well-established measurement scales were used for consistency and

[2] The authors thank an anonymous reviewer for this suggestion.

[3] Kock's approach is an interesting alternative way to assess common method bias in a context of PLS-SEM (Kock, 2015). The authors thank an anonymous reviewer for this comment.

reliability purposes. All measures were reflective and comprised of multiple item scales. Seven-point Likert type scales were used for all constructs. All measurement scales were sourced from existing validated scales with some minor wording changes introduced to adapt the scales more closely to the ICE being studied. The original scales and final wording are detailed in Appendix B. Most coefficients for composite reliability and indicator reliability are above the threshold of 0.7, verifying acceptable levels of internal consistency (Hair, Hult, Ringle, & Sarstedt, 2014). For each construct, average variance extracted (AVE) exceeds the 0.5 level. These results confirm convergent validity. Discriminant validity criteria is satisfied as shared variances are larger than the AVE (Fornell & Larcker, 1981) and Heterotrait-Monotrait Ratio of Correlations (HTMT) matrix indicates that all values are below the 0.85 threshold (Henseler, Ringle, & Sarstedt, 2015). Being cognizant that unobservable factors other than the explanatory variables of interest could influence the modeled relationships with ICE, the authors included control variables in both models 1 and 2. In addition to standard control variables such as age and gender, the authors included a control measure for perceived fairness of the contest as extant research indicates that this could be an extraneous factor in contest (Gebauer et al., 2013). Perceived fairness of the contest relates to the ability of the contest platform to act with justice and transparency. Additionally, the website's ease of use was also included as a control for similar reasons (Flavián, Guinalíu, & Gurrea, 2006). Website ease of use refers to both the perceived ease in finding needed information and the perceived efficiency of design of the website. As a further step toward rigor, the authors assessed the predictive validity of the models following the eight-step procedure proposed by Cepeda Carrión, Henseler, Ringle, and Roldán (2016) and replicated by Mourad and Valette-Florence (2016). Results indicate a similar R2 training sample (R2 = 0.78) and R2 holdout sample (R2 = 0.79); thus, providing supplemental support for this study's conceptual model.

5. Results

Table 2 details the PLS path modeling results for Study 1. In this first model, perceptions of ICE is the specified dependent variable with extrinsic motivation (EM), intrinsic motivation (IM), and perceived challenge (PC) as the independent variables. Both main effects of EM and IM are statistically significant ($p < 0.05$ and 0.01, respectively) as is the main (quadratic) effect of PC ($p < 0.05$). Neither interaction term is statistically significant, which is interesting given our hypotheses. The overall model captures an R^2 equal to 0.72 (adjusted; $p < 0.01$). Study 1 results provide initial confirmation of H1 while H2a and H2b are not supported. While the results with this particular subject population do not support the proposed interaction effects, the authors note the results of the qualitative interviews in which several of the subjects admitted to being overwhelmed by the Piaggio task challenge. Given the importance of PC to H2, it is reasonable to assume that the contest challenge was too difficult for many of the participants. Another potential issue contributing to these results is the fact that interaction between company representatives and subjects in the innovation challenge was minimal relative to an actual innovation contest venture. Either of these two factors could be a statistical artifact of either the Study 1 student subject population or the task design.

Similar to the first analysis, Study 2 modeled the impact of EM, IM, and PC on individual perceptions of ICE. In this study, subjects were exposed to multiple interactions with company representatives and model a relationship that is closer to a true ICE when compared to Study 1 subjects. Descriptive statistics and pairwise correlations associated with all variables in the study are shown in Appendix C. Path modeling results are detailed in Table 3 and indicate a pattern that is consistent with that of the first study with regard to main effects; yet, these data do support the hypothesized interaction effects. Study 2 results largely mimic those of Study 1 with the exception that H1, H2a, and H2b are each initially supported in the second subject population. The overall model variance captured ($R^2 = 0.66$, adjusted; $p < 0.01$) is slightly less than the initial model, yet still substantial ($R^2 = 0.72$; $p = 0.000$).

Goodness-of-fit path model (e.g., SRMR) do not need to be assessed as PLS-SEM "is causal-predictive in nature" (Hair, Sarstedt, & Ringle, 2019a). To assess the model's nomological validity, the authors rely on the statistical significance of the path coefficients, the prediction-oriented R2 variance explained (Hair et al., 2014). The coefficients of determination (i.e., R^2 values) serve as the main criteria for evaluating the model and its predictive accuracy (Henseler & Sarstedt, 2013). The R^2 value of 0.66 represents a substantial amount of variance explained (Chin, 1998).

To test H1 and evaluate the positive quadratic effect of PC on ICE, we employed a two stages procedure, which is a quadratic analysis recommended by Hair et al. (2019). The first stage consists in estimating the main effect model (without quadratic terms) to obtain the scores of the latent variables. In the second stage, the latent variable scores of the independent latent variable from stage one and quadratic variable scores are introduced with single-item measure. This procedure indicates that the quadratic effect of PC on ICE (see Fig. 2) is statistically significant in both studies ($\beta = 0.586$; $p = 0.021$; $\beta = 0.606$; $p = 0.029$) thus supporting H1. The influence of PC on ICE is not linear and suggests an inverted U-shape relationship. Low PC entails low ICE while high PC entails low ICE, showing that an optimal challenge (not too simple, not too difficult) increases ICE. This enriches extant literature in two ways. First, it extends literature on innovation contests by revealing that PC is an antecedent of ICE. Second, it strengthens both self-determination theory and flow theory by showing empirical evidence of the necessity to provide compelling challenges to enhance an optimal experience of participants (Csikszentmihalyi, 1988; Mathwick & Rigdon, 2004).

Confirming our expectations, the interaction of EM and PC on ICE is negative and statistically significant ($p < 0.05$) as is the interaction of IM and PC ($p < 0.05$). The interaction effects are negative and linear for IMxPC ($\beta = -0.862$; $p = 0.037$), thus confirming H2a, and negative and linear for EMxPC ($\beta = -0.272$; $p = 0.044$), also confirming H2b. The use of a non-student subject pool and much greater company-subject interaction in study 2 could arguably indicate that the non-statistically significant study 1 interaction results (H2a, H2b) were a statistical anomaly.

To further investigate the moderating effect of perceived challenge, the authors analyzed the plots shown in Figs. 3 and 4. Perceived

Table 2
Study 1 PLS Path Modeling Results for Antecedents to ICE.

Latent variable	Path coefficient	Standard error	*t*-value	*p*-value	*f*2
Perceived Challenge (PC)	0.586	0.249	2.351	0.021	0.054
Extrinsic Motivation (EM)	0.294	0.130	2.266	0.026	0.050
Intrinsic Motivation (IM)	0.679	0.122	5.581	0.000	0.302
Interaction (IM*PC)	−0.493	0.352	−1.400	0.165	0.019
Interaction (EM*PC)	−0.091	0.306	−0.299	0.766	0.001
R^2	F	*p*-value	Bootstrapped R^2	LCI (95%)	UCI (95%)
	51.264	0.000	0.725	0.614	0.823

Table 3
Study 2 PLS Path Modeling Results for Antecedents to ICE.

Latent variable	Path coefficient	Standard error	*t*-value	*p*-value	*f*2
Perceived Challenge (PC)	0.606	0.320	1.889	0.029	0.056
Extrinsic Motivation (EM)	0.154	0.063	2.456	0.007	0.058
Intrinsic Motivation (IM)	0.921	0.262	3.507	0.000	0.203
Interaction (IM*PC)	−0.862	0.241	−3.486	0.037	0.086
Interaction (EM*PC)	−0.272	0.134	−2.029	0.044	0.054
R^2	F	*p*-value	Bootstrapped R^2	LCI (95%)	UCI (95%)
	55.249	0.000	0.665	0.432	0.853

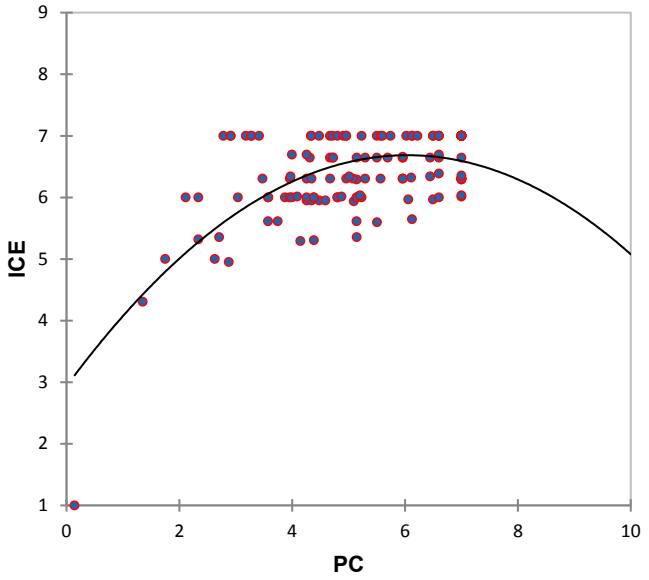
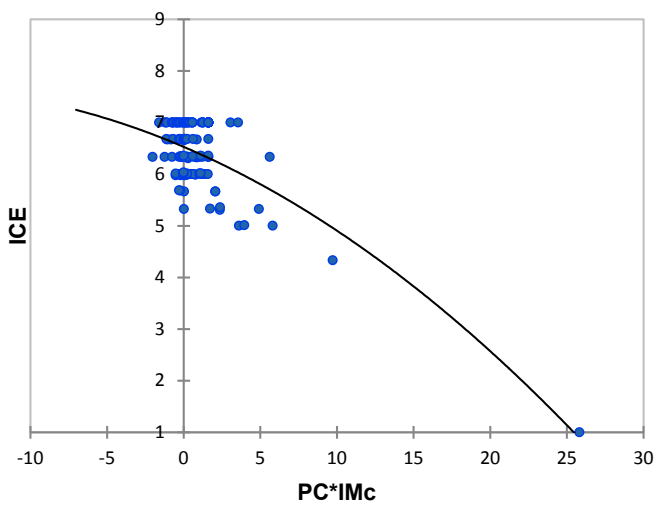


Fig. 2. Main effect of PC on ICE.

challenge is shown to negatively moderate the relationship between both extrinsic and intrinsic motivation and ICE in both models. The first plot reveals a decreasing moderating effect of PC on IM ranging from −1SD to + 5SD, being stronger for higher levels of PC. Similarly, the second plot reveals a decreasing moderating effect of PC on EM. This effect is particularly strong for values of PC higher than + 1SD. This indicates a slightly different moderation effect of PC. For extrinsically motivated participants, the detrimental effect of PC begins at + 1SD which demonstrates that they are less sensitive to difficult challenges (this effect is not significant around the mean of EM). On the contrary, for intrinsic motivation the crowding-out (detrimental) effect begins for less motivated participants at −1SD (around IM mean), advocating for more sensitivity toward PC.

These results are in accordance with the self-determination theory view that suggests that an overly complicated challenge might be perceived as a controlling force from contest organizer. This can be explained by the fact that an overly difficult challenge reduces the sense of competence and the feeling of autonomy thus alleviating the initial positive link between internal motivation and ICE. Concerning external motivation, when the associated effort of their participation is higher than the perceived benefit, engagement might diminish (Kottke & Mellor, 1986). The authors note that each of the control variables included in the two models revealed non-significant effects (each $p > 0.05$) giving support that no alternative effect might be due to age, gender, perceived fairness of the contest, and website ease of use.

In order to further investigate the interaction of intrinsic and extrinsic motivation, a *post hoc* analysis was conducted with Study 2 data. In that examination, the authors analyzed the influence of EM for low, medium, and high conditions following the prescription of Preacher and Hayes (2008) (see Appendix D for detailed path estimates for low, high and full sample models). The low condition represents one standard deviation below the sample mean of intrinsic motivation and the high condition represents one standard deviation above. Interestingly, this analysis shows that participants with lower levels of extrinsic motivation perceive a lower ICE than participants with higher levels of extrinsic motivation, all else being equal. This shows a positive *crowding-out* effect of extrinsic motivation. This effect seems to be most accentuated for the region of low intrinsic motivation and less pronounced for high levels of intrinsic motivation. At low levels of intrinsic motivation, participants who are less extrinsically motivated have a relatively lower compelling innovation experience than those who are more extrinsically motivated. Similarly, for higher levels of intrinsic



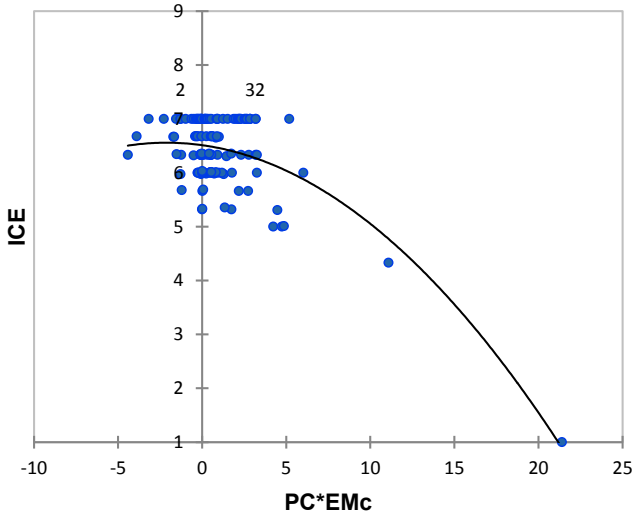


Fig. 3 and 4. Interactions between perceived challenge and intrinsic and extrinsic motivations on innovation context experience.

motivation, the positive influence of extrinsic motivation on intrinsic motivation and ICE becomes less influential. Despite a negative interaction term in the regression equation3, which might indicate a contrary effect of predictors (i.e., the effect of IM on ICE gets smaller when EM gets higher), this negative interaction effect is mitigated by the main effects of EM and IM on ICE. Consequently, for low level of intrinsic motivation, extrinsic motivation positively affects the effect of intrinsic motivation on ICE (crowding out effect). Thus, H3 is partially supported (see Appendix D for detailed path estimates for low, high and full sample models).

These findings are in accordance with the self-efficacy literature (Bandura, 1977). This literature stipulates that creative tasks are rewarding for the sake of intellectual challenge of solving the innovation problem, which corresponds here to an internalized extrinsic motive. Accordingly, self-efficacious participants are likely to set high goals and strategically plan to attain them. Moreover, this is congruent with SDT, which proposes three major drivers of motivation: competence, autonomy and relatedness. The authors posit that the moderating effect of extrinsic motivation is reinforcing the autonomy of participants as it signals that the reward is "informational" instead of "controlling" (Gagné & Deci, 2005). As a result, this effect augments and confirms people's experience of competence adding to the involvement in the task and enhanced intrinsic motivation (Deci, Ryan, et al., 1999).

Finally, short-term and long-term consequences of ICE are detailed in Table 4. Panel 1 of Table 4 shows PLS path modeling results with WTP as the dependent variable. Panel 2 models RPI in subsequent innovation contest as the criterion variable.

Panel 1 results provide support for H5 as ICE is shown to positively affect willingness to participate ($\beta = 0.556$; $p < 0.01$). The R^2 value of 0.30 represents a moderate amount of variance explained (Chin, 1998). This result is in line with SDT theory that suggests that pleasant experience favors customers interest to accept future participation. Panel 2 models RPI as the dependent variable with ICE as the independent variable. These data support H6 as ICE positively affects RPI ($\beta = 0.387$; $p < 0.01$). The R^2 value of 0.15 represents a relatively lower, yet statistically significant, amount of variance explained compared to that for willingness to participate (Chin, 1998). This result extends previous literature on ICE and RPI by revealing a new consequence of ICE as well as a new antecedent of RPI. This can be explained by the fact that a positive ICE requires the customers to be involved in the company innovation project. They improve their knowledge about the company and are thus more sensitive to its future innovations. Individuals' perceptions of the company as well as its product innovativeness, two key dimensions of RPI, are thus enhanced.

6. Discussion

6.1. Theoretical contributions

Garcia Martinez (2017) and Ghezzi et al. (2017) argue that research on innovation contests needs a stronger theoretical underpinning to better understand past research and to guide future research. This lack of a theoretical underpinning is considered by some scholars as an important shortcoming in the innovation literature (Adamczyk, Bullinger, & Möslein, 2012). Building on flow theory and self-determination concepts, the authors begin to address this dearth of theory-driven research. Using theory to go beyond the classical utilitarian/hedonic dichotomy, this study further gives support to the notion that the ICE construct is a complex phenomenon that deserves continued examination. The present research both confirms and advances previous work on customer participation and innovation contests in the upstream stages of the NPD process (Allen et al., 2017; Nishikawa, Fuchs, Ogawa, & Schreier, 2016). Thanks to the development of a theoretical framework, this study proposes a refined understanding of the ICE construct through the identification of new antecedents and consequences. The framework presented here is based on positive oriented concepts. While there is some emerging research on negative ICE[5], it is not germane to the theoretical framework at hand.

The second proposed contribution is the introduction of the perceived challenge (PC) construct. SDT has been challenged by the notion that external factors (e.g., monetary rewards) do not diminish autonomy and intrinsic interest because they signal that the task is important. For example, "offers of incentives for high performance may make individuals feel freer regarding whether and how to perform the task, but individuals additionally feel more driven to carry the task out. This performance pressure, as well as perceived self-determination, increases intrinsic interest (Eisenberger, Pierce, & Cameron, 1999). The authors propose to contribute to the aforementioned debate by empirically showing the importance of perceived challenge, which reinforces the sense of self-efficacy and fosters perceived competence proposing a more granular view of SDT. Additionally, the present study demonstrates that extrinsic motivators can have an additive effect on intrinsic motivation, thereby enhancing the innovation experience and other performance outcomes.

This study confirms the flow theory proposition that an optimal state of flow results when task challenge and individual skills are in balance and elevated above some critical threshold (Mathwick & Rigdon, 2004; Novak, Hoffman, & Yung, 2003). While both extrinsic and intrinsic motivations are noted in the innovation contest literature (Adamczyk et al., 2012), this study investigates the crucial, and previously unexplored, role of perceived challenge. It especially reveals the amplifying role of PC, since an increase in PC increases the positive relationship between motivations (extrinsic and intrinsic) and perception of ICE. The introduction of the PC variable helps scholars better understand the mechanisms that lead to a stronger ICE by going beyond the main effect relationships of extrinsic and intrinsic motivations. A compelling and sufficiently inspiring innovation contest might enhance situational interest (Deci & Ryan, 1985).

Third, this study provides initial evidence of previously untested consequences of ICE, namely the willingness to participate in subsequent innovation contests ventures and the company's perceived reputation for product innovation. Taking both a short- and long-term perspective of ICE, this research provides scholars with insight into two complementary outcomes of developing a successful innovation contest venture. Fournier (1998) notes that participation in a "brand community" can make people feel more involved with and closer to the brand. This intimacy between customers and a company can be fostered by initiating an ongoing dialogue with customers via electronic posts or conversations. Tasks such as asking questions, giving support, providing information, and proposing ideas each contribute to strengthening the link between the customer and the company in an innovation contest setting.

In addition to the functional, emotional, and self-expressive benefits delivered to customers (Aaker, 1996), a carefully designed innovation contest enables scholars to investigate a *participatory* benefit to customers. In short, providing customers with an appropriately challenging task, where they get to interact with company representatives and like-minded others, have their ideas listened to, and are rewarded (extrinsically and/or intrinsically) by the experience can lead to customers that are more willing to engage in subsequent innovation contest ventures and that regard the sponsoring company as an innovative leader in their field.

[4] ICE = 5.900 + 0.331IM + 0.257EM-0.465EMxIM

[5] The very limited research on "negative" ICE deals with deviant behaviors such as anti-Semitic, misogynistic, or racial postings (e.g., Gatzweiler et al., 2017; Heidenreich et al., 2015).

Table 4
Model results for short-term and long-term outcomes of ICE.

Short-term outcome					
Latent variable	**Path coefficient**	**Standard error**	***t*-value**	***p*-value**	***f*2**
Willingness to Participate(WTP)	0.556	0.101	7.681	0.000	0.457
R^2	F	*p*-value	Bootstrapped R^2	LCI (95%)	UCI (95%)
	58.996	0.000	0.307	0.146	0.507
Long-term outcome					
Latent variable	**Path coefficient**	**Standard error**	***t*-value**	***p*-value**	***f*2**
Reputation for Product Innovation(RPI)	0.387	0.095	4.820	0.000	0.189
R^2	F	*p*-value	Bootstrapped R^2	LCI (95%)	UCI (95%)
	23.235	0.000	0.153	0.052	0.311

6.2. Managerial implications

Companies that conduct innovation contests are tasked with a two-fold charter. This study highlights two critical prescription areas for managers. First, innovation contests often solely promote extrinsic motivations such as monetary rewards to attract participants. While common, this approach might potentially have negative consequences. Extrinsically motivated individuals could engage in a certain task simply because of the anticipated benefits associated with the outcome. As soon as extrinsically motivated participants have achieved their goal of being explicitly compensated, further engagement might end unless subsequent incentives are offered. Managers would be wise to balance their reward policies by considering nurturing intrinsic motivation. For example, offering non-monetary incentives such as praise, performance rankings, or recognition of expertise can often have relatively greater motivational impact than monetary rewards alone. Following Steils and Hanine (2019), managers can construct the contest instructions in such a manner that they positively engage participants on an emotional, as well as cognitive, level.

Second, this study suggests that innovation contest managers should ensure that task difficulty is reasonably matched with the capabilities of contest participants. Any mismatch on this dimension, either a too high or too low perceived challenge, is likely to lead to participant dissatisfaction, which can result in a lack of future participation. Thus, we encourage managers to analyze the individual characteristics of the participants and develop specific segmentation protocols in order to create a match between contest participants and the difficulty of the challenge. This can be accomplished in a variety of ways. One approach entails pre-testing likely contest participants regarding their level of comfort, interest, and familiarity with the pertinent aspects of the contest task. This is typically a two to three minutes survey and is common practice in screening participants for marketing focus groups, for example. Another approach could be to have facilitators assist participants during the contest. This is the approach that Michelin took in the Study 2 here and, while relatively costlier and more labor intensive, often serves to lessen any participants' task anxiety as well as offer the sponsoring company an opportunity to deliver intrinsic reward such as praise. Other more statistically rigorous methods, such as conjoint analyses, whereby likely participants choose between multiple packages of information relative to the contest task can be utilized in some instances. Participant answers can be screened against a predetermined set of company preferences to help match appropriate individuals to the contest task. Of course, any approach should be iterative with results being captured and refined for actual contest performance accuracy over time.

6.3. Limitations and further research

This research contains both study limitations and avenues for future research. Study 1 was an innovation challenge where participant interactions with the sponsoring company were limited relative to the more active interactions of an innovation contest venture. The authors also note that while the subject population in Study 2 had multiple interactions with representatives of the sponsoring company, one cannot independently verify that each subject was a "customer" of the company (i.e., Michelin). Thus, while the second study represents a strong and clear progression in complexity over the first study, future research could focus entirely on actual company customers to test if the present model holds under even more exacting examination.

Future research could focus on structured communities (i.e., virtual or real). Members who share a high sense of community are more likely to engage in community activities such as giving support, affording solutions, or solving problems (Gebauer et al., 2013). This participation tends to reinforce the experiential side of innovation contest. Scholars could consider any social relationships triggered in innovation contests communities that might enhance a sense of belonging to a group or of peers sharing similar values and reciprocal behaviors (Lakhani & Von Hippel, 2003). Sense of community could be introduced in our conceptual model in order to take a more granular view of ICE, notably with respect to PC.

Research on the darker side of innovation contests is in its infancy and warrants greater analysis. As firms increasingly utilize on-line platforms that yield control to external participants, the risk of a negative experience is increased (Gatzweiler, Blazevic, & Piller, 2017; Gebauer et al., 2013; Heidenreich, Wittkowski, Handrich, & Falk, 2015). Some research notes that deviant content could lead to dissatisfaction with the contest and ultimately to negative word-of-mouth or reputational issues regarding the contest sponsor. Our measure of ICE is a positive-oriented scale that measures the degree of a positive experience and does not explicitly capture a negative experience, per se. Further research could consider the development of a new measurement tool that more explicitly addresses the issue of a negative experience.

The present study focuses on the ideation stage of product development when a sponsor company seeks out new product ideas by tapping into a community knowledge (Franke, Keinz, & Schreier, 2008; Jeppesen, 2005). Scholars might find fruitful research questions by examining more downstream consequences of ICE. Similarly, the theoretical model of ICE could be enhanced with a longitudinal data study. Such a temporal statistical advancement can improve the validity of survey-based research. Furthermore, as innovation contests mainly tap into the general public to generate new ideas, expert users such as lead-users or emergent-nature consumers are not necessarily represented in a given contest (i.e., interest and/or challenge not sufficiently stimulating) (Magnusson, 2009; Poetz & Schreier, 2012). To check whether the participant's *expertise* plays a role in this framework, future studies could be enhanced with an examination of the innovation contest experiences of expert versus non-expert users. Finally, it is also important to note that the extrinsic or intrinsic motivations are not mutually exclusive. The extant research dichotomy seems artificial in the particular context of creativity (Deci, 1971; Hennessey & Amabile, 2010; Miller et al., 1988). As suggested by our results, future research could explore to what extent, and in what measure, the combination of intrinsic and extrinsic factors motivate users to engage in innovation contests.

Appendix A. . Key dimensions of individual motivations to participate in innovation contest ventures

Hedonic Benefits	Leo: *I really liked posting my ideas on the forum, I have this passion to surpass myself when I am participating in an innovation challenge, I enjoyed a lot to try to find new things for a scooter.* Pierre-Edouard: *I appreciated the playful side of the challenge on a concrete product that has a technological side.*
Pride of Authorship	Marc: *when I reached 80 points on the forum, I felt very proud because it meant that my idea was really good, and my work gained recognition from the community.* Quentin B: *the fact that my work is viewed by Piaggio managers encourages me to spend time and effort, it is an honour that my idea is recognized having a good potential. It's pretty impressive anyway to shake hands with the CEO of the Piaggio brand.*
Utilitarian Benefits	Pierre*: I learned a lot about the scooter area in general that I was not aware before, it allowed me to see what are the latest trends on the motorbike market, especially regarding mechanical power transmission.* Leo: *It is an added value on the CV to have won an innovation challenge sponsored by the brand Piaggio, it's something official that can be included in a CV.* Anthony: *I prefer a monetary reward than a recognition incentive, it is not enough to motivate community members, everyone is not a fan of Piaggio.*
Time Perception	Alexis: *after taking the decision to participate to this innovation challenge I took into consideration time parameters, and I regularly considered the probability to win, I think all this time could have been allocated to a higher winning probability project.*Lorenzo: *I hesitated before starting the challenge because I did not want to waste my time.*Antoine: *if we have had more time, ideas would have been certainly much better, especially for technical issues*
Sense of Community	Pierre-Edouard: *what interested me in this experience is the ability to see an idea evolving from scratch to something pretty well finished. This was possible due to the collective work managed through the forum on the website and thanks to the feedbacks, and advices from Piaggio engineers.*Valérian: *Sharing your ideas with the community allows you to get inspired and develop your idea by taking a different path of the one taken if you had remained alone.*
Perceived Challenge	Simon: *I agree that it is easy to have information on a brand but it is a real challenge to compete with professional that can come up with cutting edge innovations, this is the reason why I am not interested in participating in innovation contests.*Gabriel: *the contest is really challenging, this increases my interest in keeping participating longer, I feel intellectually stimulated by the difficulty of finding a good solution*

Appendix B. . Construct scale development

	Study 1				Study 2			
Latent Constructs[1]	**Loadings**	**Composite reliability**	**Indicator Reliability**	**AVE**	**Loadings**	**Composite reliability**	**Indicator Reliability**	**AVE**
Extrinsic Motivation								
The opportunity to earn monetary rewards encourages me to participate in this contest	0.573	0.857	0.328	0.499	0.590	0.872	0.348	0.531
I think participating in this contest allows me to improve my employment capacities	0.684		0.468		0.698		0.487	
Joining this contest enhances my reputation as product expert in the Agorize community	0.784		0.614		0.742		0.551	
I derive satisfaction from influencing product usage by other customers	0.651		0.424		0.744		0.554	
I derive satisfaction from influencing product design & development	0.769		0.591		0.777		0.604	
Joining this sponsor contest enhances my knowledge about the product and its usage	0.754		0.569		0.802		0.644	
Original scale: Deci, Eghrari, Patrick, & Leone, 1994								
Intrinsic Motivation								
I had a great deal of freedom to make choices while searching for innovative ideas	0.856	0.916	0.733	0.783	0.856	0.907	0.732	0.733
I was able to express my creativity and ideas in searching for innovative ideas	0.892		0.795		0.918		0.842	
Participating in this Sponsor Brand contest is a great play activity	0.906		0.821		0.841		0.707	
Original scale: Deci et al., 1994								
Perceived Challenge								
Participating in this innovation contest this way pushed me to perform to the best of my ability	0.895	0.894	0.800	0.736	0.773	0.969	0.598	0.651
Participating in this innovation contest this way stretched my capabilities to the limit	0.847		0.717		0.857		0.735	
This innovation contest challenges me	0.831		0.691		0.809		0.655	
Participating in this innovation contest provides a good test of my skills	n.a		n.a		0.786		0.617	
Original scale: Mathwick & Rigdon, 2004								
Innovation Contest Experience								
I have enjoyed the entire Sponsor Michelin contest I joined	0.871	0.926	0.759	0.806	0.732	0.865	0.536	0.682
I had a good time searching for innovative ideas during the Michelin Contest	0.901		0.812		0.876		0.767	
This task was a lot of fun	0.920		0.846		0.861		0.742	
Original scale: adapted from Dahl & Moreau, 2007								
Reputation for Product Innovation								
Piaggio/Michelin has a track record of successful new automobiles	0.873	0.936	0.759	0.726	0.840	0.955	0.704	0.751
Piaggio/Michelin is a cutting-edge automobile company	0.889		0.781		0.867		0.745	
Piaggio/Michelin is a new product leader in its industry	0.871		0.754		0.871		0.762	
Piaggio/Michelin is an innovative company when it comes to automobiles	0.877		0.766		0.910		0.831	
Piaggio/Michelin is a progressive company when it comes to automobiles	0.844		0.712		0.890		0.794	
With regard to automobiles, Piaggio/Michelin is a creative company	0.789		0.630		0.901		0.811	

I expect Piaggio/Michelin to introduce innovative autos in the future.	0.819		0.669		0.780		0.611	
Original scale: Henard and Dacin, 2010								
Website Ease of Use (control)								
The organization of components on the home page of the web site seems good	0.903	0.943	0.811	0.853	0.868	0.957	0.755	0.846
I find easily what I am looking for on this site	0.947		0.897		0.942		0.887	
The website seems easy to use	0.918		0.838		0.949		0.900	
It is easy to distinguish the menu buttons on the pages	0.928		0.854		0.918		0.842	
Original scale: Flavián et al., 2006								
Perceive Fairness of the Contest (control)								
The jury adequately considered the viewpoint of this contest in making decision	0.946	0.781	0.915	0.608	0.884	0.716	0.809	0.778
The jury of this contest treated the participant with respect and dignity in making decisions	0.529		0.501		0.867		0.747	
Original scale: Gebauer et al., 2013								

[1]Participation Intention (PI) is not included because it is a single item construct.
n.a: non-applicable, item not measured in study 1.

Appendix C. . Descriptive statistics and pairwise correlation for study 2.

	Means	S.D.	1	2	3	4	5	6	7	8	9	10
1 ICE	5.8545	1.0973	1.000									
2 IM	5.7960	1.1364	0.746*	1.000								
3 EM	5.0418	1.2065	0.453*	0.409*	1.000							
4 PC	5.7481	1.1716	0.624*	0.681*	0.551*	1.000						
5 PI	5.4328	1.4890	0.066	0.161*	0.016	-0.007	1.000					
6 RPI	5.2367	1.2944	0.426*	0.392*	0.404*	0.535*	-0.039	1.000				
7 Age	22.7985	3.0968	0.038	-0.008	-0.011	-0.014	0.084	-0.031	1.000			
8 Gender	0.6194	0.4873	-0.031	-0.042	-0.029	-0.113*	0.084	-0.112	0.029	1.000		
9 PF	5.5485	1.4624	0.455*	0.600*	0.474*	0.805*	0.032	0.549*	0.016	-0.116	1.000	
10 WEA	5.5429	1.2141	0.486*	0.535*	0.474*	0.533*	0.093	0.523*	-0.035	-0.080	0.516*	1.000

* $p < 0.05$, S.D. Standard deviation, ICE: innovation contest experience, IM: intrinsic motivation, EM: extrinsic motivation, PC: perceived challenge, RPI: reputation for product innovation, PF: perceived fairness, WEA: website ease of use, SC: sense of community

Appendix D. . PLS path estimation for the crowding out effect of extrinsic motivation on intrinsic motivation

	High intrinsic motivation (n = 67)			Low intrinsic motivation (n = 67)			Full sample (n = 134)		
	β	***t*-value**	f^2	**β**	***t*-value**	f^2	**β**	***t*-value**	f^2
IM	0.610	2.226**	0.079	0.883	3.938***	0.246	0.331	5.398***	0.224
EM	0.472	1.699*	0.046	0.692	3.216***	0.164	0.257	4.671***	0.168
IMxEM	−0.503	−1.175	0.022	−0.722	−2.051**	0.067	−0.465	−8.161***	0.512
Model R2 (Adj.): 0.19(0.17)				Model R2 (Adj.): 0.52(0.50)			Model R2 (Adj.): 0.69(0.68)		
95% Interval: 0.14–0.51				95% Interval: 0.33–0.72			95% Interval: 0.44–0.85		

Notes: IM = intrinsic motivation; EM = extrinsic motivation; ICE = innovation contest experience;*** $p < 0.001$; ** $p < 0.05$; *$p < 0.1$.

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