



## Engaging in knowledge exchange: The instrumental psychological ownership in open innovation communities

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# ENGAGING IN KNOWLEDGE EXCHANGE: THE INSTRUMENTAL PSYCHOLOGICAL OWNERSHIP IN OPEN INNOVATION COMMUNITIES

**Abstract.** Online communities have become a vital channel for professionals to expand their networks and initiate new strategic collaborations. Such online behaviors have led to multiple types of innovation potential that are based on the co-creation of ideas toward new solutions. Yet, very little is known about the role of psychological ownership of knowledge in professionals' knowledge exchange in these communities that are based on voluntary contributions. We apply the psychological ownership theory and posit that psychological ownership of knowledge is instrumental to increased knowledge exchange intentions of professionals. Informed by the theory, our model incorporates several enablers of online engagement which could be associated with psychological ownership. Our exploratory quantitative study evidences that perceived ownership of knowledge plays a critical instrumental role in idea exchange behavior. We evidence how personal outcome expectations, organizational innovativeness and affective community commitment are associated with psychological ownership of knowledge which is an important predictor of intentions to exchange knowledge in open innovation communities. Implications for theory and practice are discussed.

**Keywords:** psychological ownership; idea exchange; co-creation; online communities; open innovation

## 1. INTRODUCTION

The co-creation of innovations through the expansion of networks and new strategic collaborations (Lee, Olson, & Trimi, 2012) has been rapidly moving to the online environment thanks to the advancements of information and communication technologies (ICT) (Gebauer, Füller, & Pezzeri, 2013; von Hippel, 2009). In this regard, online communities for co-creation that neither restrict participation nor are under tight corporate control have had a major impact on managing innovation (von Hippel,

2009; Stock, Oliveira, & von Hippel, 2014; Desouza et al., 2009). Such online communities intended for co-creation have also been referred to as *open innovation communities* (Fleming & Waguespack, 2007). Consisting of a community of users sharing a passion for a certain profession or hobby, the examples of co-created solutions range from sports products (Füller, Bartl, Ernst, & Mühlbacher, 2006) to new business models and information technology (IT) solutions (Di Gangi & Wasko, 2009).

As Fleming and Waguespack (2007, p. 165) argued, “open innovation communities typically lack financial or corporate backing, forgo personal ownership rights to their members’ work, rely on volunteers, and eschew formal planning and management structures.” Co-creation is highly dependent on the contributors’ fluidity, devotion, and perceptions of ownership of the collective outputs being created during the exchange of ideas (Faraj, Kudaravalli, & Wasko, 2015; McAdam & McClelland, 2002). Cross-disciplinary research on perceived ownership has shown how individuals develop feelings of ownership toward a variety of objects, such as ideas and the knowledge they possess (Li, Yuan, Ning, & Li-Ying, 2015; Pierce, Kostova, & Dirks, 2003; Isaacs, 1933). Theory of psychological ownership suggests that such a psychological state of ownership is influenced by situational and individual factors and steers individuals’ behavior (Pierce, Kostova, & Dirks, 2001). Indeed, individuals’ cognitive or perceived ownership<sup>1</sup> has been demonstrated to tremendously influence manifested behaviors in collaborative settings (Ford & Staples, 2010; Li et al., 2015; Pierce et al., 2003). Psychological ownership of knowledge could therefore be instrumental, and have an essential role in the knowledge exchange behavior of professionals in open innovation communities once psychological ownership is perceived.

The situational and individual factors behind psychological ownership of knowledge and its potential instrumental role remain unaddressed in open innovation community context. In fact, previous knowledge ownership studies have mainly addressed the extent to which individuals perceive certain knowledge belonging to the organization (Jarvenpaa & Staples, 2000) or the extent to which individuals feel ownership of certain IT (Barki, Paré, & Sicotte, 2008). Only a handful of studies have linked

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<sup>1</sup> Ownership in this regard relates to the individual’s own perception and psychological state rather than a granted right of ownership.

psychological ownership of knowledge to online knowledge exchange behavior. Researchers have identified the willingness to share knowledge as one of the positive effects of perceived ownership (Ford & Staples, 2010; Wasko & Faraj, 2000; Pierce et al., 1991). Thus, the understanding regarding the situational and contextual factors (Jarvenpaa & Staples, 2000; Pierce et al., 2003) that could explain the instrumental role of psychological ownership remains in an early state. Our study is positioned on this gap in the research.

Our study has two objectives: 1) to understand the situational and individual enablers behind psychological ownership and 2) to investigate the instrumental role of psychological ownership between the enablers of psychological ownership and knowledge exchange intentions. We draw from the psychological ownership theory (Pierce et al., 2001) because it could explain the instrumental role of psychological ownership on knowledge exchange intentions in open innovation communities. As the situational and individual factors that foster psychological ownership are context-driven (Pierce et al., 2003) and psychological ownership is unlikely to emerge without devotion and engagement with the ownership targets (Pierce et al., 2001), we investigate several factors that are associated with increased engagement in open innovation communities and position them as potential enablers of psychological ownership. While our study is informed by the psychological ownership theory, we draw the context-specific enablers of engagement from knowledge exchange literature.

We conducted a quantitative study based on the surveys collected from 205 professionals, contributing to varying open innovation communities. In particular, our study addresses the co-creation phase of ideation, commonly referred to as "idea generation," which researchers have argued is the core aspect of co-creation in innovation processes (Desouza et al., 2009; Stock et al., 2014). In terms of theoretical contributions, the study 1) validates the instrumental role of psychological ownership of knowledge in to the online community context; 2) uncovers enablers of psychological ownership and 3) provides evidence for the positive effect of psychological ownership on exchange intentions in open innovation communities. As the co-creation practices in an open ecosystem are

becoming increasingly important (Echeverri & Skålen, 2011; Desouza et al., 2009), the findings of this article advance the understanding of professionals' contribution behavior online and provide an explanation for the unmapped psychological state of knowledge ownership.

The article is structured as follows. First, we lay the groundwork for the types of communities and co-creative settings under investigation. We then explain the instrumental perspective to psychological ownership of knowledge and proceed to extracting the relevant enablers of psychological ownership. By doing so, we present the theoretical model of our study and provide several hypotheses for testing the model. The third section of the article explains the procedures and methods to operationalize our theoretical model and the efforts made to collect and analyze the data. The remainder of the article discusses the relevance and importance of the evidenced results.

## **2. THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT**

This section provides information on the key literature related to our research topic and builds the theoretical framework, which is subsequently validated in the study.

### **2.1 Co-creation in open innovation communities**

Idea generation in online communities has been argued as a key activity of innovation processes (Desouza et al., 2009; Stock et al., 2014). Such co-creation of ideas in online communities can take place in discussions where the proposed ideas are challenged, iterated, piloted, and exchanged until the resulting innovations are achieved (Desouza et al., 2009; Franke & Shah, 2003). While ideation can take place in physical sites established by organizations, it is as likely that online communities and the resulting innovations form wherever users interact around a particular theme and common interest (Füller, Mühlbacher, Matzler, & Jawecki, 2010), for example, in open innovation communities.

Open innovation communities are multifold and include the following: 1) communities established for one common purpose (e.g., an Internet engineering task force [Fleming & Waquespack, 2007]

consisting of unpaid, informal workers who aim to improve and maintain TCP/IP standard); 2) open source communities (Morgan, Feller, & Finnegan, 2012); and 3) open innovation alliances, such as the Open Handset Alliance that brings multiple firms together to innovate under certain rules and joint-ownership of intellectual property (Han et al., 2012). These communities often share a common profession (e.g., communities of practice, as defined by Lave & Wenger, 1991), and complementary know-how is utilized to increase the potential for out-of-the-box thinking and the resulting innovations, as in case three above.

In this study, we characterize open innovation communities as 1) primarily online communities (which does not exclude co-located activities) (Han et al., 2012); 2) relying on voluntary contributions (Faraj et al., 2015); 3) including either structured or unstructured forms of collaboration with either explicitly or implicitly named leaders (Fleming & Waquespack, 2007; Han et al., 2012); and 4) emerging ad hoc and dissolving accordingly (Füller et al., 2010).

Most research on ideation relates to the creativity of individuals (Garfield, Taylor, Dennis, & Satzinger, 2001; Nunamaker, Applegate, & Konsynski, 1987), techniques and approaches for turning ideas into solutions (Dean, Hender, Rodgers, & Santanen, 2006), and technology support (e.g., group decision support systems) for ideation (Santanen, Briggs, & Vreede, 2004; Nunamaker et al., 1987) in collaborative intra- and inter-organizational settings. While the importance of online communities in innovation practice is widely recognized (Faraj et al., 2015; Han et al., 2012; Füller et al., 2010), little is known about the ownership perceptions of knowledge in open and collaborative knowledge exchange settings.

## 2.2 Psychological ownership of knowledge

Theory of psychological ownership considers psychological ownership as a critical component of individuals' efforts to cherish and nurture their own possessions (Pierce et al., 2001). The targets of possessions are typically sensed as belonging to oneself, which creates motivation to devote oneself to and pursue those targets further (McDougall, 1923). This cognitive-affective state of perceived

psychological ownership can be defined as the “individual’s cognitive ownership of tangible or intangible targets” (Pierce et al., 2001). Cross-disciplinary research has emphasized a variety of targets of ownership, which has tremendously increased both the scope of the concept and its causes and effects. The target of ownership can range from an organization (Jarvenpaa & Staples, 2001; Constant, Kiesler, & Sproull, 1994) or personal possessions (e.g., goods, materials) (Pierce et al., 2003) to groups and people (Avey, Avolio, Crossley, & Luthans, 2009). It has been shown that psychological ownership can also target ideas and knowledge (Isaacs, 1933; Li et al., 2015). In this study, we investigate psychological ownership of the collective output created in an open innovation community and define psychological ownership of knowledge as: “The degree to which a person perceives the open innovation communities’ knowledge output belongs to him/her”.

The theory of psychological ownership states that such perceived feelings of ownership have important outcomes that can be behavioral, emotional or psychological (Pierce et al. 2001). This theory posits that psychological ownership causes people to engage in various kinds of positively associated behaviors toward social entity they feel ownership of (e.g., citizenship behavior in a nation, good deeds in a family or group) (Vandewalle, Van Dyne, & Kostova, 1995; Pierce et al., 2003) and positive outcomes in organizational settings, ranging from positive organizational scholarship (Cameron, Dutton, & Quinn, 2003) to increased competence and efficacy (White, 1959; Van Dyne & Pierce, 2004). Psychological ownership of the organization has also been shown to increase knowledge sharing (Constant et al. 1994). In online community context, psychological ownership of the community itself could lead to improved quality of contributions (Lee & Suh, 2015). We propose in this article that psychological ownership of knowledge is associated with knowledge exchange intentions in an open innovation community.

The theory of psychological ownership also posits that psychological ownership emerges in a context that individuals can identify with and in which they feel that they can reach outcomes of importance to them (Pierce et al., 2001). Psychological ownership is likely to emerge if an individual believes they

have ways to apply the target, that they intimately know the target, and have a chance to investigate oneself in relation to the target (Pierce et al., 2001, 2003). Indeed, experiences in a particular context are important to development of psychological ownership as multiple individual and contextual factors can enable such perceptions (Pierce et al., 2001). Pierce et al. (2003) and Karahanna, Xu, and Zhang (2015) discussed how individuals operating in differing contexts with different ownership targets hold different motives to activate ownership that have not been accounted for in research.

We draw from this theory and posit that *psychological ownership is instrumental* in open innovation communities. Indeed, Pierce et al. (2003) argued that ownership is essentially instrumental. White (1959) offered similar explanations, arguing how perceptions of possessions make certain activities, pleasures, and outcomes possible. Ownership can be instrumental in open innovation communities as ownership is a central part of social interaction, allowing us to transmit our values and knowledge to others (Dittmar, 1992). Thus, several enablers could feed on to increased perceptions of ownership which in turn can lead to positive outcomes. Figure 1 shows the base model of our research.

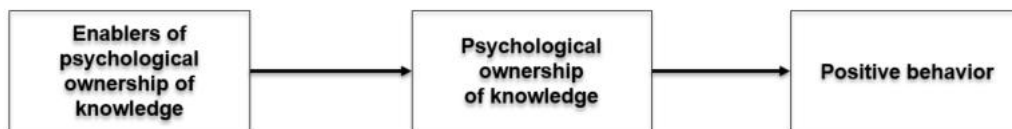


Figure 1 Base model of the study in open innovation community context

Only a handful of studies have addressed the enablers of psychological ownership and none of these studies specifically addresses psychological ownership in the context of online communities. These enablers are discussed next and hypotheses for the study are derived.

### 2.3 Enablers of psychological ownership of knowledge

Engagement in open innovation communities is voluntary and but most importantly, effortful activity (Faraj et al., 2015; McAdam & McClelland, 2002). Similarly, the emergence of psychological ownership requires devotion and effortful action to take place in a specific context (Pierce et al., 2001). As psychological ownership emerges based on both contextual and individual factors (Pierce et al., 2003;



Karahanna et al., 2015), we argue that factors explaining professionals' online engagement behaviors could explain such contextually-bound enablers of psychological ownership. Thus, we propose that enablers of online engagement are associated with increased psychological ownership of knowledge in the context of open innovation communities.

Guided by the theory of psychological ownership, we draw from knowledge exchange literature and identify contextual and individual enablers of online engagement in open innovation communities. Each potential enabler will be presented below.

### 2.3.1 Reaching desired outcomes in the community

We propose *personal outcomes expectations* as the first enabler of psychological ownership of knowledge in the open innovation community context. This concept is defined as an individual's belief that task accomplishment leads to a beneficial outcome (Chiu, Hsu, & Wang, 2006). We select this enabler because psychological ownership is unlikely to emerge if an individual does not recognize the importance of a target to reaching his or her important outcomes (Pierce 2001, 2003). As White (1959) and Pierce et al. (2003) argued, motivation to acquire possessions comes from our need to reach desired outcomes in a certain environment effectively. Outcome expectations are also critical in determining engagement behavior. Knowledge exchange in open innovation communities does not occur without a purpose, regardless of whether the objectives are to increase one's own professional status or to innovate and give back to the society (Chiu et al., 2006). Professionals partaking in open innovation communities, regardless of the voluntariness of their contributions, do care about the outcomes, such as the expansion of their personal networks and their status in these networks (Hsu, Ju, Yen, & Chang, 2007). Thus, we hypothesize as follows:

H1: Personal outcome expectations are positively associated with psychological ownership of knowledge.

### 2.3.2 Enabling collaboration and commitment

We propose *organizational innovativeness* as the second psychological ownership enabler. Organizational innovativeness is described as an organizational climate that allows employees to partake in cross-organizational collaboration in which information freely flows (Brock, Zmud, Kim, & Lee, 2005). Researchers have argued that having a place to dwell and experiment is a key enabler of psychological ownership (Van Dyne & Pierce, 2004; Pierce et al., 2003). A professional's home organization can significantly influence the type of activities their employees take part in and to which extent these activities are effective and purposeful (Han et al., 2012). Thus, the extent to which an organization allows the exchange of ideas with potential collaborators in open innovation communities could influence whether professionals identify themselves with the community and exercise the ability to control the ownership object and the environment (Pierce et al., 2003). We therefore propose that organizations can promote the perception of psychological ownership in online communities by encouraging their employees to partake in collaborative innovation activities.

H2: Organizational innovativeness is positively associated with psychological ownership of knowledge.

We propose *affective community commitment* as the third enabler of psychological ownership. It is defined as emotional attachment to, identification with, and involvement in the group (Bateman, Gray, & Butler, 2011). Social interaction and the community or group around us (e.g., family, friends, colleagues, an online community) have been discussed as a potential source of increased perception of ownership (Li et al., 2015). The affection for and identification with a certain group or organization, namely affective commitment, has been also addressed as an important driver of knowledge exchange behavior in online communities (Li et al., 2015; Bateman et al., 2011). Attachment to the online community relates strongly to the notion of belonging, having a place to dwell (Avey et al., 2009; Pierce et al., 2003), and identifying oneself as a part of the community (Gebauer et al., 2013) which are important predictors of psychological ownership (Pierce et al., 2001). Indeed, the sense of community

has been evidenced as a core determinant of knowledge exchange behavior in innovation communities (Gebauer et al., 2013).

H3: Affective commitment is positively associated with psychological ownership of knowledge.

### 2.3.3 Social experiences and openness to experience

We propose *previous online knowledge exchange experiences* as the fourth enabler. This enabler is defined as the degree to which a member has conducted idea and knowledge exchange activities in online communities (Davenport & Prusak, 1998). The role of previous experiences has been evidenced to shape the perceptions of ownership (Dittmar, 1992). Dittmar (1992) explained how individuals who engage in their environment experience the objects, learn something from them, and grow attached to them. Similar arguments were provided by Pierce et al. (2001). Perceptions of attachment are closely related to our past (who we were), our interaction in our social environment (e.g., exchange of knowledge with our colleagues or peers), and the growth to attach to certain ownership targets at the present time (Cram & Paton, 1993). Therefore, previous online knowledge exchange experiences can influence the perception of ownership targets (Dittmar, 1992).

H4: Previous online knowledge exchange experiences are positively associated with psychological ownership of knowledge.

Finally, we propose *openness to experience* as the fifth enabler as perception of ownership requires identification with the objects that cannot be achieved without effort (Pierce et al., 2001). We define this concept in the context of our study as the willingness to accept and explore new targets and environments. Pierce et al. (2003) explained how people that are "open to experience" might be more willing to pursue new targets, such as new knowledge from an external source. Co-creation is fundamentally about creativity and the refinement of ideas in a collaborative manner (Desouza et al., 2009; Stock et al., 2014). Durkheim (1957) and Pierce et al. (2003) have argued that by creating and taking part in the creation, individuals develop attachment to the targets. When discussing and

collaborating in an open and voluntary manner, even sharing of incomplete or complex contextual knowledge (Zhang, Venkatesh, & Brown, 2011; Ford & Staples, 2010), self-awareness, identity, and personality play a major role in whether a person involves him or herself in such action.

In open innovation communities, sharing of incomplete knowledge in the form of ideas might be an experience not everyone is open to (Ford & Staples, 2010). Similarly, not everyone wants to engage early on in a community that is just about to form under a certain common topic of interest (von Krogh, Spaeth, & Lakhani, 2003). As an example, professionals in many cases would need to interact in the early stages of collaboration, which most likely consists of engaging in networks beyond one's own strong connections (Ren, Kraut, & Kiesler, 2007; Nahapiet & Ghoshal, 1998). Despite the lack of such openness to experience (Pierce et al., 2003), professionals in many cases do need to engage in emerging communities as the bonds with other members and relations with previously not well known or even unknown users and newcomers in the online community (Ren et al., 2007) are most likely to be built through increased frequency of interaction (Cartwright & Zander, 1953).

H5: Openness to experience is positively associated with psychological ownership of knowledge.

#### 2.4 Outcome of psychological ownership of knowledge

Our study proposes that psychological ownership of knowledge is instrumental to *intention to exchange knowledge* in open innovation communities. This concept is defined as individuals' behavioral intention to take part in an exchange of ideas (Venkatesh & Bala, 2008). Previous studies have indicated that psychological ownership increases willingness to exchange knowledge (Ford & Staples, 2010; McLure, Wasko, & Faraj, 2000). This positive influence has been witnessed especially when sharing partial knowledge with collaborators, i.e., sharing the amount of knowledge that is necessary to protect competitive advantage or to ensure the recipient does not experience cognitive overload (Ford & Staples, 2010). Similarly, Lee and Suh (2015) showed that psychological ownership of the online community itself contributes to the quality of contributions in the respective community.

Psychological ownership of the organization can also lead to increased knowledge sharing (Constant et al., 1994). These findings give us confidence to propose that psychological ownership of knowledge could increase the intention to exchange knowledge in open innovation communities. We propose that:

H6: Psychological ownership of knowledge is positively associated with the intention to exchange knowledge.

Our theoretical model is summarized in Figure 1.

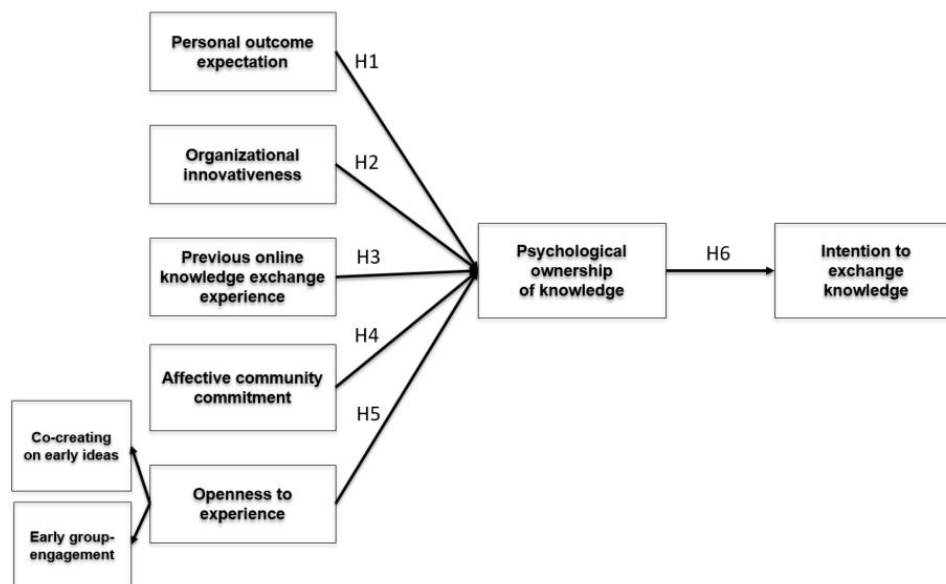


Figure 2 Theoretical model

### 3. METHOD AND MEASURES

#### 3.1 Data Collection

The data to test our theoretical model of psychological ownership of knowledge was collected via a survey. The focus was on professionals who contribute to an open innovation community and have a contractual obligation either in academia or in a company, as 1) participation in universities and companies has been argued to be the key future need for innovative practice (Gassmann, Enkel, & Chesbrough, 2010); and 2) the enabling or restricting nature of knowledge work is established by the

organizational practice itself. The context was selected because of the increasing importance of community-based and innovation practices linking industry with academia in online communities.

An intensity sampling method was applied (Patton, 1990) to focus on information-rich cases that were well suited for the phenomenon of interest and would not distort the findings due to deviance or unusualness. As the study concerned professionals' perceptions of psychological ownership in open innovation communities that do not restrict participation only to strong ties, we chose to focus on the self-reported data of the professionals on their co-creation activities. The online survey was distributed to users of various open innovation communities (e.g., the idea sharing platform Idea Space<sup>2</sup>) that fit the characteristics of our inquiry, i.e., voluntary participation and not being restricted to pure B2B/multi-firm settings. The investigation was not limited to a single online site, as in many cases the activity takes place on different sites (e.g., social networking sites) that the professional commonly visits (Füller et al., 2010). Specific framing questions were included in the questionnaire to confirm whether the respondents fit the sample. These questions included the role of the respondent in the organization and whether he or she had a contract with a company or in academia.

Non-response bias was not seen to be a major issue, as the study was not limited to a particular service. A total of 241 responses were collected through an online survey tool (SurveyGizmo). After exclusion of the student sample and careful data screening and removal of incomplete answers, 205 responses were selected for this study. Sample demographics are presented in Table 1.

Table 1. Sample characteristics

<b>Variable</b>	<b>Category</b>	<b>Frequency</b>
Gender	Female	95 (46%)
	Male	110 (54%)
Age	20–35 years	103 (50%)
	36–50 years	82 (40%)
	51–68 years	20 (10%)
Nationality	European	164 (80%)
	North American	14 (7%)
	Asian	27 (13%)
Employment	Industry	78 (38%)

<sup>2</sup> <http://idea.space.eu>. The users of this specific open innovation community come from universities and companies; purely educational collaborations are heavily undertaken in the platform. We excluded students from the sample while they might have participated in industry collaborations and thus be linked to the activities of the professionals.

	Academy	127 (62%)
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### 3.2 Measures

Our literature review on the enablers of psychological ownership revealed no scales for the psychological ownership of knowledge and openness to experience. For the remaining factors, previous scales could be identified that captured the essential meaning of the factor and were adapted for this study.

#### 3.2.1 Adapting existing scales

The survey items of our study were either based on existing validated scales or developed by combining our literature analysis results with accompanying theoretical definitions to generate new constructs and a survey format. The items measuring the *intention to exchange knowledge* were adapted from Venkatesh and Bala (2008). The construct measuring *personal outcome expectations* in relation to increase in network and reputation was identified in and adapted from Chiu et al.'s (2011) study on virtual communities. The *affective community commitment* scale was addressed through affective and emotional attachment to group/community, as presented by Bateman et al. (2011). Existing scales from the experiences/history of interactions perspective presented by Davenport and Prusak (1998) and Lin, Hung, and Chen (2009) were adapted as *previous online knowledge exchange experience* (e.g., "I exchange ideas in virtual communities"; 1 = Never; 5 = Very frequently). The *organizational innovativeness* construct was adapted from Bock et al.'s (2005) study.

#### 3.2.2 Newly developed scales

The most prominent construct of our study was the perceived *psychological ownership of knowledge*. As discussed in section 3, no available studies had addressed or operationalized the ownership of knowledge as perceived by an individual. The existing theoretical definition of the ownership of ideas was derived from the psychological ownership of knowledge belonging to an organization, as theorized by Jarvenpaa and Staples (2001), and the psychological organization commitment as theorized by Van Dyne and Pierce (2004). Further discussion in Snare's (1972) and Pierce et al.'s (2003) studies regarding

the role of emotional attachment and affective sensation in ownership allowed us to develop items relevant for our study. Similarly to the related but not matching constructs on perceived possessions, the construct of was developed based on multiple items (e.g., "I get emotionally attached [e.g., feeling proud, sense of ownership] to the resources I am creating"; 1 = Strongly disagree, 5 = Strongly agree). We especially followed the guidelines developed by DeVellis (1991) on new scale development in terms of clarity, generation of items, and initial validation with a group of experts. Participants of online innovation communities were consulted in both group and one-on-one discussions during the scale development process regarding the concept of ownership. This stage enabled us to ensure the clarity and completeness of the measurement and helped us to formulate items (format of measurement) in an understandable manner.

The operationalized second-order construct *openness to experience* related to the unexplored psychological ownership enabler. The following characteristics of open innovation communities guided the operationalization of related constructs: 1) co-creation in open innovation communities especially concerns the exchange of incomplete knowledge in the form of ideas in a community building process (Desouza et al., 2009; Stock et al., 2014); and 2) exchange of knowledge with an emerging and living network of voluntary contributors (Füller et al., 2010; Han et al., 2012), beyond one's own strong networks and even with previously unknown stakeholders (Ren et al., 2007). Similarly to psychological ownership of knowledge-construct, participants of online innovation communities were consulted (DeVellis, 1991) and we were able to extract two sub-dimensions for the study.

The first openness to experience dimension, *co-creating on early ideas*, dealt with the exchange of incomplete knowledge in an online community. It was defined as individuals' preference to expose their early and incomplete ideas to the contributions of others (Zhang et al., 2011). Previous knowledge management studies have reported differences in the personalities and preferences of professionals with respect to exchanging ideas that are contextual and at an immature stage (e.g., seeking requirements and the gaps for a new potential information system) (Zhang et al., 2011; Ford & Staples,



2010). None of the studies we found had operationalized a construct to be used for the study. Thus, three items were formulated in the form of statements. One sample item is as follows: "I enjoy online collaboration on ideas that haven't matured" (1 = Strongly disagree; 5 = Strongly agree).

The second openness to experience dimension, *early group engagement*, dealt with engaging in an emerging online community consisting of peers beyond one's own strong networks. It is defined as the willingness of an individual to engage in an emerging online community at the early stage of group building (Von Krogh et al., 2003). This dimension was reported in the previous literature on bonding between strong and weak ties in an online community (Von Krogh et al., 2003; Ren et al., 2007; Granovetter, 1977). The four items of the construct were formulated in relation to engagement in an emerging community (Von Krogh et al., 2003) and exchange of knowledge beyond strong ties (Ren et al., 2007; Granovetter, 1977). One sample item is as follows: "I do not mind exchanging ideas with peers unfamiliar to me in an open professional virtual community" (1 = Strongly disagree; 5 = Strongly agree).

As the questionnaire was close to being finalized, it was further examined by 12 academic researchers for refinement and content validation. The refinement process focused especially on the wording and readability of the items, paying particular attention to the new scales (DeVellis, 1991). Only minor changes were made to the instrument (e.g., open innovation community was referred to as "open professional virtual community" for the sake of clarity), confirming that the data collection could begin and the new scale validation could take place during measurement model testing.

## **4. DATA ANALYSIS AND RESULTS**

### 4.1 Measurement model testing

We first conducted an exploratory factor analysis (principal axis factoring, promax rotation) in SPSS to test the loadings of the new scales. We expected the Kaiser-Meyer-Olkin measure of sampling adequacy to be greater than 0.60. We also expected a statistically significant Bartlett's test of

sphericity for proceeding with the factoring. Most of the items loaded into their respective constructs as expected, and were greater than 0.7, as suggested by Chin (1998). One item was dropped from the affective community commitment construct and another from early group engagement construct due to low loadings. The model adequacy indicators (Table 3) were all within acceptable levels, fitting the suggested thresholds (Hu & Bentler, 1999): CFI > 0.95, SRMR < 0.8 RMSEA close to 0.60. The validity and the reliability assessment are presented in Annex 2. The composite reliability scores ranged between 0.797 and 0.938, exceeding the suggested 0.71 threshold (Chin, 1998; Comrey & Lee, 1992). The average variance extracted (AVE) by a measure was also satisfactory, exceeding the score of 0.5 (Fornell & Larcker, 1981).

We calculated the AVE for the second-order construct openness to experience by averaging the squares of first-order constructs' items (co-creating on early ideas and early group engagement) as standardized loading on the second-order construct. AVE values higher than 0.50 were expected to confirm the majority of the variance in the first-order constructs is shared with the second-order construct. The AVE of openness to experience was 0.86, which exceeds the recommended threshold. Therefore, convergent and discriminant validity was verified.

Table 3. Fit statistics

Model	SRMR	CFI	RMSEA	Chi-Square
Measurement model	.0441	0.969	0.42	481 with 353 df
Structural model	.0533	0.954	0.51	545 with 357 df

We tested for the common method bias (CMB) before testing the structural model. We used a two-step approach: First, we ran Harman's one-factor test (Podsakoff & Organ, 1986) in SPSS. By entering all variables of our model into EFA and testing whether one general factor accounts for the majority of the covariance amongst the variables (Podsakoff & Organ, 1986), we observed that CMB is likely not

an issue, as no single factor accounted for the majority of the variance in the model (40%). Second, we conducted the marker variable approach presented by Lindell and Whitney (2001) in AMOS software (Annex, table 10). We also collected data from multiple online sites, finally concluding that there was an absence of method bias. Annex 2 further describes how we tested for common method bias (CMB) before proceeding to the structural model.

#### 4.2 Structural model testing

We tested the hypotheses with AMOS software. As Marcoulides and Saunders (2006) suggested, we tested for the statistical power of our study. As our data was normally distributed and the sample size was large enough to exceed well over the suggested 0.8 threshold, we proceeded to the structural model testing. The structural model, including path coefficients, significance levels, and R-square values, is shown in Figure 3. Hypotheses H1, H2, H3, and H6 were supported. Hypotheses H4 and H5 were not supported, as indicated in Table 4.

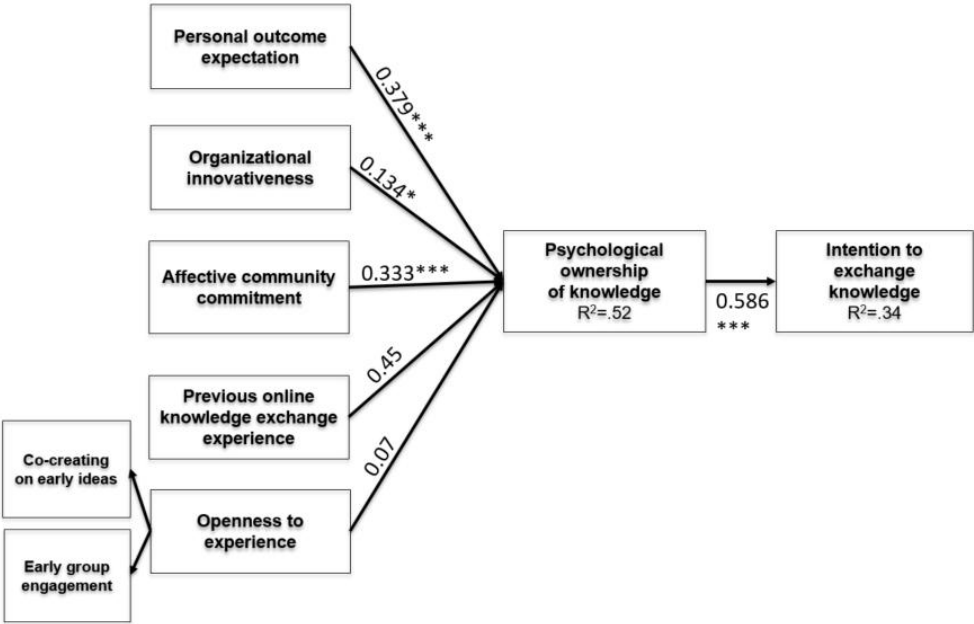


Figure 3. Structural model

Table 4. Summary of results

Hypothesis	Path coefficients	
H1: POE + POK	0.379***	Supported
H2: ORG + POK	0.134*	Supported

H3: ACC - OWN	0.333***	Supported
H4: EXP + POK	0.45	Not supported
H5: OTE + POK	0.07	Not supported
H6: POK - INT	0.586***	Supported

\*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.10

## 5. DISCUSSION AND CONCLUSION

The objective of our study was to understand the enablers behind psychological ownership of knowledge and to investigate the instrumental role of psychological ownership between the enablers of psychological ownership and intentions to exchange knowledge. In response to our first objective, our study evidenced how outcome expectations, organizational innovativeness, and affective community commitment contribute to the cognitive-affective state of psychological ownership. Contrary to two of our enabler-related hypotheses, previous knowledge exchange experiences or openness to experiences, do not contribute to psychological ownership of knowledge. However, our study provided evidence that psychological ownership is associated with knowledge exchange intentions. These findings are important as they provide the first evidence for the instrumental perspective of psychological ownership in open innovation community context.

### 5.1 Contributions to theory

The study makes several contributions to theory. The first contribution regards the validation of the instrumental role of psychological ownership in a professional online community context. Previously, scholars have not yet addressed this critical topic in relation to knowledge exchange activities that can tremendously influence psychological ownership and its effects on organizational behavior. Our findings show that psychological ownership indeed is explained by several contextual and individual enablers (which explain 52% of the construct's variance) and perceptions of ownership make certain activities, pleasures, and outcomes possible (White, 1959; Pierce et al., 2003), evidenced with association to knowledge exchange intentions.

Secondly, we identify previously unidentified enablers of psychological ownership in the open innovation community context. Guided by the psychological ownership theory, we drew potential enablers of psychological ownership from existing knowledge exchange literature. We evidenced how outcome expectations in terms of increase in network and reputation, the sense of and attachment to community, and favorable organizational innovativeness contribute toward a sense of ownership. Contrary to Pierce et al.'s (2003) study, previous knowledge exchange experience and openness to experience in the context of open innovation communities do not seem to influence psychological ownership. By validating these enablers, we extend psychological ownership from general influences (Pierce et al., 2003; Avey et al., 2009) to specific knowledge exchange-related factors that are contextually defined (Karahanna et al., 2012).

Finally, as a third key contribution, our study evidences a positive influence of psychological ownership on knowledge exchange intentions. We especially extend the theoretical understanding of psychological ownership from community (Lee & Suh, 2015), organization (Constant et al., 1994) and social entity –related possessions (VandeWalle et al., 1995; Pierce et al., 2003) to ownership of knowledge in open innovation communities. As research that links psychological ownership to knowledge sharing is still in an embryonic state (Li et al., 2015), our study contributes to theory of psychological ownership with a contextual understanding of psychological ownership in open innovation community context.

## 5.2 Contributions to practice

Our research has strong practical contributions and implications. It is important to emphasize how open innovation communities that deal with voluntary contributions differ from intra-organizational communities. Perception of ownership can therefore lead to positive behavior in the community. While individuals are likely to practice control of their possessions and view them as “theirs” (Isaacs, 1933; Pierce et al., 2003), in this research we report some of the first evidence about promotion-based ownership, as discussed by Avey et al. (2009).

How can organizations utilize our findings? As we foresee more and more examples of innovations that come from outside the organization through crowdsourcing, alliances, and user communities (Gebauer et al., 2013; Stock et al., 2014; Fleming & Waquespack, 2007), organizations are dependent on evidence of the varying practices that can lead to favorable outcomes. In our study, all of the participants were professionals who had an employer organization behind them. Contributing in open innovation communities can lead to personal gain for the participants. In fact, professionals expect such gains (e.g., better cooperation and increase in reputation, as discussed by Chiu et al., 2006). One of the factors we examined was the extent to which the organization allows its members to contribute to such online communities. This factor contributes to perceptions of ownership, which is an essential part of knowledge exchange behavior in open innovation communities. Organizational policies and practices that also link to open innovation communities can facilitate the uptake and management of external intellectual property and innovation.

### 5.3. Limitations and conclusion

Our study does have limitations. We did not account for the type of knowledge professionals share and co-create in open innovation communities. We especially encourage extending the research on sharing incomplete or complex knowledge, as it could reveal some of the further enablers of psychological ownership in a professional context. Our sampling was not limited to one particular environment and we could not track the community in which each respondent participated. However, we do see the benefits of observing users in a specific emerging community, as Pierce et al. (2003) argued how situational forces can influence individuals and ownership targets.

Another important remark is that beyond psychological ownership, we chose not to replicate the theoretical models from psychological ownership studies. Our constructs do bear similarities to those used by Karahanna et al. (2015) and Avey et al. (2009). However, we do believe that including specific enablers of psychological ownership of knowledge in the context of open innovation communities, were able to explain a yet unaddressed perspective which would have not been possible otherwise. Accounting for various types of personality traits could also provide an explanation for certain types

of enablers, as elaborated with respect to pursuing ownership-related goals (Winter, Stewart, Klohen, & Duncan, 1998). Our study did not indicate that previous knowledge exchange experience has any influence on psychological ownership. However, we did not account for the difference between good and bad experiences. We believe there is more to the role of previous experiences as facilitators of our perceptions “to have” and “to do.” Further investigation of both utilitarian and hedonic motives (e.g., Van Boven & Gilovich, 2003) is thus needed in perceived ownership research in the context of open innovation communities.

We urge researchers to study these aspects further, as they could provide explanations of the underlying co-creation behaviors. We also acknowledge that further analysis of the varying roles of professionals in both companies and universities will likely point out differences in the sharing practices in online settings. As one of the first studies to address psychological ownership of knowledge in online communities, this article serves as a discussion opener on instrumental psychological ownership in professional online communities.

## **REFERENCES**

- Avey, J. B., Avolio, B. J., Crossley, C. D., & Luthans, F. (2009). Psychological ownership: Theoretical extensions, measurement and relation to work outcomes. *Journal of Organizational Behavior*, 30(2), 173–191.
- Barki, H., Paré, G., & Sicotte, C. (2008). Linking IT implementation and acceptance via the construct of psychological ownership of information technology. *Journal of Information Technology*, 23(4), 269–280.
- Bateman, P. J., Gray, P. H., & Butler, B. S. (2011). The impact of community commitment on participation in online communities. *Information Systems Research*, 22(4), 841–854.

- Bock, G., Zmud, R., Kim, Y., & Lee, J. (2005). Behavioral Intention Formation in Knowledge Sharing: Examining the Roles of Extrinsic Motivators, Social-Psychological Forces, and Organizational Climate. *MIS Quarterly*, 29(1), 87–111.
- Cameron, K., Dutton, J., & Quinn, R. (2003) Positive organizational scholarship. San Francisco: Berrett-Koehler.
- Cartwright, D., and Zander. A. (1953) Group cohesiveness: Introduction in Group dynamics: Research and Theory. D. Cartwright and A. Zander (eds). Evanston, IL: Row Peterson.
- Chin, W. (1998) Issues and opinion on structural equation modeling. *MIS Quarterly* 22: 7–16.
- Chiu, C.-M., Hsu, M.-H., & Wang, E. T. G. (2006). Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision Support Systems*, 42(3), 1872–1888.
- Comrey, AL. and Lee, HB. (1992) A First Course in Factor Analysis, 2nd ed. Lawrence Erlbaum Associates: Hillsdale, NJ.
- Constant, D., Kiesler, S., & Sproull, L. (1994). What's mine is ours, or is it? A study of attitudes about information sharing. *Information Systems Research*, 5(4), 400–421.
- Cram, F., & Paton, H. (1993). Personal possessions and self-identity: the experiences of elderly women in three residential settings, *Australian Journal of Aging*, 12, 19–24.
- Davenport, T.H., & Prusak, L. (1998) Working Knowledge: How Organizations Manage What They Know. Harvard Business School Press: Boston, MA.
- Dean, D. L., Hender, J. M., Rodgers, T. L., & Santanen, E. L. (2006). Identifying quality, novel, and creative ideas: Constructs and scales for idea evaluation. *Journal of the Association for Information Systems*, 7(10), 646–698.



- Desouza, K. C., Dombrowski, C., Awazu, Y., Baloh, P., Papagari, S., Jha, S., & Kim, J. Y. (2009). Crafting organizational innovation processes. *Innovation: Management, Policy & Practice*, 11(1), 6–33.
- DeVellis, R. F. (1991) *Scale development: Theory and applications*. Newbury Park, CA: Sage.
- Di Gangi, PM., & Wasko, M. (2009). Steal my idea! Organizational adoption of user innovations from a user innovation community: A case study of Dell IdeaStorm, *Decision Support Systems*, 48(1), 303–312.
- Dittmar, H. (1992) *The social psychology of material possessions: To have is to be*. New York: St. Martin Press.
- Durkheim, E. (1957) *Professional ethics and civil morals*. London: Routledge and Kegan Paul.
- Echeverri, P., & Skalen, P. (2011). Co-creation and co-destruction: A practice-theory based study of interactive value formation, *Marketing Theory*, 11(3), 351–373.
- Faraj, S., Kudaravalli, S., & Wasko, M. M. (2015). Leading Collaboration in Online Communities. *MIS Quarterly*, 39(2), 393–412.
- Fleming, L., & Waguespack, D.M. (2007). Brokerage, Boundary Spanning, and Leadership in Open Innovation Communities, *Organization Science*, 18(2), 165–180.
- Ford, D. P., & Staples, S. (2010). Are full and partial knowledge sharing the same? *Journal of Knowledge Management*, 14(3), 394–409.
- Fornell, C. & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error, *Journal of Marketing Research*, 18, 39–50.
- Franke, N., & Shah, S. (2003). How communities support innovative activities: An exploration of assistance and sharing among end-users, *Research Policy*, 32(1), 157–178.

- Füller, J., Bartl, M., Ernst, H., & Mühlbacher, H. (2006). Community based innovation: How to integrate members of virtual communities into new product development. *Electronic Commerce Research*, 6(1), 57–73.
- Füller, J., Mühlbacher, H., Matzler, K., & Jawecki, G. (2010). Consumer empowerment through internet-based co-creation. *Journal of Management Information Systems*, 26(3), 71–102.
- Garfield, M. J., Taylor, N. J., Dennis, A. R., & Satzinger, J. W. (2001). Research report : Modifying Paradigms - individual differences, creativity techniques, and Exposure to Ideas in Group Idea Generation. *Information Systems Research*, 12(3), 322–333.
- Gassmann, O., Enkel, E., & Chesbrough, H. (2010). The future of open innovation. *R&D Management*, 40(3), 213–221.
- Gebauer, J., Füller, J., & Pezzeri, R. (2013). The dark and the bright side of co-creation: Triggers of member behavior in online innovation communities. *Journal of Business Research*, 66(9), 1516–1527.
- Granovetter, M. (1973). The strength of weak ties, *American journal of sociology*, 78(6), 1360–1380.
- Han, K., Oh, W., Im, K. S., Oh, H., Pinsonneault, A., & Chang, R. M. (2012). Value Cocreation and Wealth Spillover in Open Innovation Alliances. *MIS Quarterly*, 36(1), 291–316.
- Hu, L.T., & Bentler, P.M. (1995). Evaluating model fit. In R.H. Hoyle (ed.), *Structural Equation Modeling: Concepts, Issues, and Applications*. Thousand Oaks, CA: Sage, 76–99.
- Hsu, M. H., Ju, T. L., Yen, C. H., & Chang, C. M. (2007). Knowledge sharing behavior in virtual communities: The relationship between trust, self-efficacy, and outcome expectations, *International Journal of Human–Computer Studies*, 65, 153–169.
- Isaacs, S. (1933). *Social development in young children*. London: Routledge & Kegan Paul Limited.

- Jarvenpaa, S. L. & Staples, D. S. (2001). Exploring perceptions of organizational ownership of information and expertise, *Journal of Management Information systems*, 18(1), 151.
- Karahanna, E., Xu, S. X., & Zhang, N. A. (2015). Psychological Ownership Motivation and Use of Social Media. *Journal of Marketing Theory and Practice*, 23(2), 185–207.
- Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.
- Lee, S. M., Olson, D. L., & Trimi, S. (2012). Co-innovation: convergenomics, collaboration, and co-creation for organizational values. *Management Decision*, 50(5), 817–831.
- Lee, J., & Suh, A. (2015). How do virtual community members develop psychological ownership and what are the effects of psychological ownership in virtual communities? *Computers in Human Behavior*, 45, 382–391.
- Li, J., Yuan, L., Ning, L., & Li-Ying, J. (2015). Knowledge sharing and affective commitment: the mediating role of psychological ownership. *Journal of Knowledge Management*, 19(6), 1146–1166.
- Lin, M. J. J., Hung, S. W., & Chen, C. J. (2009). Fostering the determinants of knowledge sharing in professional virtual communities. *Computers in Human Behavior*, 25(4), 929–939.
- Lindell, M. K., & Whitney, D. J. (2001). Accounting for Common Method Variance in Cross-Sectional Research Designs, *Journal of Applied Psychology*, 86(1), 114-121.
- Marcoulides, G.A. & Saunders, C. (2006). PLS: A silver bullet? *MIS Quarterly*, 30(2).
- McAdam, R. & McClelland, J. (2002). Individual and team-based idea generation within innovation management: organisational and research agendas, *European Journal of Innovation Management* 5(2), 86–97.
- McDougall, W. (1923). *An introduction to social psychology*. (18th edition), London: Methuen.

- McLure, M., Wasko, M., & Faraj, S. (2000). "It is what one does": why people participate and help others in electronic communities of practice. *The Journal of Strategic Information Systems*, 9(2-3), 155-173.
- Morgan, L., Feller, J., & Finnegan, P. (2012). Exploring value networks: theorising the creation and capture of value with open source software. *European Journal of Information Systems*, 22(5), 569-588.
- Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage, *The Academy of Management Review*, 23, 242-266.
- Nunamaker, Jr, J. F., Applegate, L. M., & Konsynski, B. R. (1987) Facilitating group creativity: Experience with a group decision support system. *Journal of Management Information Systems*, 5-19.
- Patton, M. (1990). *Qualitative Evaluation and Research Methods*, Qualitative Evaluation and Research Methods, SAGE Publications, inc.
- Pierce, J. L., Kostova, T., & Dirks, K. T. (2001). Toward a Theory of Psychological Ownership in Organizations. *Academy of Management Review*, 26(2), 298-310.
- Pierce, J. L., Kostova, T., & Dirks, K. T. (2003). The state of psychological ownership: Integrating and extending a century of research. *Review of General Psychology*, 7(1), 84-107.
- Podsakoff, P.M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects, *Journal of Management*, 12(2), 531-544.
- Ren, Y., Kraut, R., & Kiesler, S. (2007). Applying Common Identity and Bond Theory to Design of Online Communities. *Organization Studies*, 28(3), 377-408.
- Santanen, E., Briggs, R., & Vreede, G. (2004). Causal relationships in creative problem solving: comparing facilitation interventions for ideation. *Journal of Management Information Systems*, 20(4), 167-197.

- Snare, F. (1972). The concept of property, *American Philosophical Quarterly*, 9(2), 200-206.
- Stock, R. M., Oliveira, P., & von Hippel, E. (2014). Impacts of Hedonic and Utilitarian User Motives on the Innovativeness of User-Developed Solutions. *Journal of Product Innovation Management*, 32(3), 389–403.
- Vandewalle, D., Van Dyne, L., & Kostova, T. (1995). Psychological Ownership: An Empirical Examination of its Consequences. *Group & Organization Management*, 20(2), 210–226.
- Van Boven, L., & Gilovich, T. (2003). To do or to have? That is the question, *Journal of personality and social psychology*, 85(6), 1193.
- Van Dyne, L. & Pierce, J. L. (2004). Psychological ownership and feelings of possession: Three field studies predicting employee attitudes and organizational citizenship behavior, *Journal of Organizational Behavior*, 25(4), 439–459.
- Venkatesh, V. & Bala, H. (2008). Technology Acceptance Model 3 and a Research Agenda on Interventions, *Decision Sciences*, 39(2), 273–315.
- von Hippel, E. (2009). Democratizing innovation: The evolving phenomenon of user innovation. *International Journal of Innovation Science*, 55(1), 29–40.
- von Krogh, G., Spaeth, S., & Lakhani, K. R. (2003). Community, joining, and specialization in open source software innovation: a case study. *Research Policy*, 32(7), 1217–1241.
- White, R. W. (1959). Motivation reconsidered: The concept of competence, *Psychological Review*, 1959, 66: 297-333.
- Winter, D., Stewart, J. O., Klohen, E., & Duncan, L. (1998) Traits and motives: Toward an integration of two traditions in personality research. *Psychological Bulletin*, 105: 230-250.
- Zhang, H., Venkatesh, V., & Brown, S. (2011). Designing Collaborative Systems to Enhance Team Performance. *Journal of the Association for Information Systems*, 12(8), 556–584.

## Annex - The constructs of the study

Table 5. Item descriptions

Construct	Mean (std dev)	Item	Item description
Intention to exchange knowledge	3.58 (0.84)	int_1	Given that I had access to relevant virtual communities, I predict that I would exchange ideas
		int_2	I intend to engage in the exchange of ideas, provided I have access to a relevant virtual community
		int_3	I plan to engage in open professional virtual communities to exchange ideas with my peers
		int_4	I will share my knowledge with others in open professional virtual communities related to my work
Personal Outcome Expectation	3.78 (0.64)	oe_1	Sharing my knowledge can improve my reputation in the open professional virtual community
		oe_2	Sharing my knowledge in an open professional virtual community will give me a sense of accomplishment
		oe_3	Sharing my knowledge will enable me to gain better cooperation from the outstanding members in the open professional virtual community
		oe_4	Sharing my knowledge will strengthen my ties with other members in the open professional virtual community
Psychological ownership of knowledge	3.66 (0.74)	pok_1	Feeling a strong ownership of the ideas and resources being created in the virtual community is important for me
		pok_2	I expect to be emotionally attached to the ideas I am sharing in open professional virtual environments
		pok_3	I get emotionally attached (e.g., feeling proud, sense of ownership) to the resources I am creating (writings, products, services)
Affective community commitment	3.43 (0.89)	acc_1	Feeling a strong connection to other members of the virtual community is important for me
		acc_2	Feeling a strong sense of belonging is important for me in virtual communities
		acc_3	Feeling like a "part of the group" is important for me in virtual communities
Early group engagement	3.45 (0.71)	ege_1	Being involved with the virtual community when the group is being formed increases my activity
		ege_2	I do not mind exchanging ideas with peers unfamiliar to me in an open professional virtual community
		ege_3	It is easy for me to get to know other members in open professional virtual communities
Co-creating on early ideas	3.44 (0.84)	ccei_1	I enjoy brainstorming online with my peers on how to turn raw ideas into real solutions
		ccei_2	I enjoy engaging in collaborative settings online when ideas are still raw
		ccei_3	I enjoy online collaboration on ideas that have not matured
Organizational innovativeness	3.46 (0.79)	org_1	My organization encourages employees to actively promote the organization on the Internet
		org_2	My organization encourages employees to develop their competences as they see fit
		org_3	My organization encourages employees to engage in cross-organizational business opportunities
		org_4	My organization encourages employees to start new collaborations with external stakeholders and organizations
		org_5	My organization puts much value on taking risks, even if such risks turn out to be a failure
Previous online knowledge exchange experience	3.00 (1.10)	exp_1	I engage with virtual communities to learn how to do things
		exp_2	I exchange ideas in virtual communities
		exp_3	I share and discuss my experiences with others in virtual communities
		exp_4	I share my thoughts with my peers in virtual communities

Table 6. Item cross-loadings

Construct	1. Intention to exchange knowledge	2. Personal outcome expectation	3. Psychological ownership of knowledge	4. Affective community commitment	5. Early group engagement	6. Co-creating on early ideas	7. Organizational innovativeness	8. Previous online knowledge exchange experience
int_1	0.921	0.577	0.325	0.465	0.569	0.567	0.252	0.620
int_2	0.938	0.618	0.359	0.543	0.574	0.578	0.332	0.654
int_3	0.913	0.596	0.339	0.522	0.545	0.549	0.292	0.651
int_4	0.883	0.585	0.293	0.412	0.568	0.540	0.293	0.633
poe_1	0.524	0.819	0.363	0.368	0.468	0.331	0.365	0.462
poe_2	0.552	0.814	0.329	0.347	0.452	0.373	0.325	0.479
poe_3	0.494	0.803	0.353	0.339	0.476	0.439	0.224	0.482
poe_4	0.567	0.855	0.355	0.367	0.526	0.399	0.351	0.519
pok_1	0.254	0.289	0.796	0.377	0.273	0.273	0.183	0.285
pok_2	0.345	0.432	0.859	0.355	0.272	0.247	0.305	0.364
pok_3	0.306	0.343	0.865	0.363	0.326	0.228	0.239	0.265
acc_1	0.489	0.356	0.434	0.909	0.366	0.421	0.244	0.428

acc_2	0.494	0.417	0.423	0.938	0.424	0.441	0.235	0.453
acc_3	0.488	0.417	0.342	0.913	0.519	0.465	0.258	0.492
ege_1	0.496	0.441	0.325	0.350	0.718	0.500	0.243	0.436
ege_2	0.445	0.482	0.250	0.341	0.793	0.502	0.214	0.464
ege_3	0.489	0.433	0.227	0.411	0.804	0.534	0.154	0.457
ccei_1	0.567	0.410	0.369	0.463	0.589	0.898	0.230	0.501
ccei_2	0.541	0.426	0.188	0.392	0.586	0.908	0.148	0.517
ccei_3	0.561	0.444	0.244	0.456	0.637	0.930	0.237	0.558
org_1	0.291	0.321	0.149	0.225	0.220	0.138	0.756	0.188
org_2	0.227	0.284	0.246	0.146	0.262	0.151	0.769	0.249
org_3	0.213	0.279	0.319	0.239	0.142	0.237	0.775	0.263
org_4	0.265	0.288	0.195	0.184	0.207	0.211	0.818	0.243
org_5	0.238	0.328	0.258	0.249	0.184	0.161	0.786	0.333
exp_1	0.600	0.540	0.326	0.420	0.457	0.455	0.236	0.849
exp_2	0.657	0.528	0.304	0.455	0.548	0.556	0.289	0.949
exp_3	0.661	0.569	0.337	0.486	0.573	0.555	0.335	0.944
exp_4	0.655	0.537	0.375	0.470	0.571	0.549	0.323	0.934

INT, Intention to exchange knowledge; POE, Personal outcome expectation; POK: Perceived ownership of knowledge; ACC, Affective community commitment; EGE, Early group engagement; CCEI; Co-creating on early ideas; ORG, Organizational innovativeness: exp, previous online knowledge exchange experience



Table 7. Descriptive statistics and inter-construct correlations

Construct	CR	AVE	ote	pok	exp	acc	poe	org	int
ote	0.927	0.864	0.964						
pok	0.797	0.569	0.415	0.868					
exp	0.938	0.793	0.723	0.379	0.944				
acc	0.910	0.772	0.600	0.495	0.514	0.937			
poe	0.841	0.571	0.707	0.516	0.634	0.490	0.869		
org	0.842	0.517	0.322	0.374	0.364	0.293	0.449	0.848	
int	0.935	0.783	0.764	0.417	0.714	0.578	0.725	0.346	0.940

Diagonal axis represents square roots of average variance extracted (AVE). CR = Composite reliability, AVE = Average variance extracted

Table 8. Common method bias test with method factor

model	Chi-square	CFI	RMSEA	Comment
All items load on respective factors	481 with 353 degrees of freedom	0.969	0.42	Significant bias if the model with the method factor is significantly better. Results indicate lack of method bias.
All items load additionally on a method factor	467 with 352 degrees of freedom	0.972	0.40	