Collaborative knowledge creation

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Abstract

In many areas of work today, innovation requires a wide breadth of knowledge and skills. As a consequence, knowledge workers may no longer find themselves working alone or exclusively with members of their own knowledge specialization, but may interact with professionals from diverse disciplines to jointly create new or emergent knowledge to produce innovations. This paper focuses on the process of collaborative knowledge creation among professionals from a range of knowledge disciplines. This research draws on relational coordination theory (Gittell 2000), organization theory (Thompson 1967) and knowledge team theory (Cooke et al., 2000), and explores the role of relational coordination in creating the conditions in which collaborative knowledge creation can flourish.

Keywords: Collaborative knowledge creation, relational coordination, social capital

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Acknowledgement: The author would like to thank Hannes Gunter, Maarten Cuijpers and Sjir Uitdewilligen for their detailed and valuable feedback. The author is responsible for any gaps that remain.
Introduction

Knowledge creation and learning have become the most important source of sustainable competitive advantage in the knowledge economy (e.g., Barney 1991, Teece 2000, Jakubik 2008). To remain competitive, it is critical for organizations that their employees constantly innovate and create new knowledge in the form of novel products and services. More and more organizations are structuring project teams that span multiple knowledge domains to accomplish specific tasks, specially tasks that involve innovation. Knowledge is therefore created through interactions, where discussions and active dialogues must take place. It is essential to better understand this process in which employees with diverse knowledge base, skills and experiences learn and create knowledge together. Only then, organizations can better exploit innovation efforts and avoid project failures.

Regardless of whether participants ultimately represent a single or multiple organizations, four process stages are central to the collaborative generation of knowledge (Du Chatenier et al., 2009). In the stage of externalizing and sharing, participants verbalize and share their implicit knowledge, information and needs. In the stage of interpreting and analyzing participants develop a deep understanding of the new information by establishing linkages between new information and preexisting knowledge. In the stage of negotiating and revising, participants order their different interpretations and reach a mutual understanding. The stage of combining and creating results in co-created knowledge, in which participants combine their different knowledge bases and accumulate and create new ideas. In the process of collaborative knowledge creation, knowledge is created on an individual and group level.

Relational Coordination Theory (RCT) (Gittell 2000) sheds light on the relational dynamics of coordination and differs from other theories by focusing not on personal relationships but rather on role-based relationships. Relational coordination focuses on how roles and assigned tasks within a particular work process fit together. Along these lines, RCT argues that coordination of work is most effectively carried out through frequent, high quality communication supported by relationships of shared goals, shared knowledge and mutual respect.

The process of collaborative knowledge creation distinguishes between knowledge exclusive to the individuals and knowledge in common within the group (Du Chatenier et al., 2009). Collaborative knowledge creation therefore involves a continuous shift from individual to collective knowledge. For instance, when a participant externalizes and shares his or her knowledge and receives feedback on the
knowledge he or she shared, the feedback initiates a dynamic exchange between individual and collective knowledge.

Relational coordination can be conceptualized as strong relationships and communication ties among participants in a work process. We expect that these relationships and communication networks will increase the breadth and depth of interactions among participants with complementary knowledge critical to successfully co-creating knowledge.

Gittell and Carmeli’s study (2009) suggested that relational coordination promotes psychological safety, which is conducive to learning. In collaborative knowledge creation learning takes place at the individual and group level. Learning at the individual level occurs during the stage of interpreting and analyzing as individuals establish linkages between new information and preexisting knowledge. Collective learning occurs in the stage of negotiating and revising as it is the team that develops a shared understanding and meaning. We expect that the relational and communication dimensions of relational coordination can overcome specific challenges resulted from the diversity of knowledge bases and organizational backgrounds, and create the conditions in which the process of collaborative knowledge creation can flourish.

This working paper is structured as follows: first, theoretical background is drawn by focusing on collaborative knowledge creation, the characteristics of its tasks and the theory of relational coordination. Second, this study explores the role of relational coordination in collaborative knowledge creation, hypotheses, research design and implementation are presented. Third, the findings, their implications and further research directions are presented.
Theory

1. The process of collaborative knowledge creation

Collaborative knowledge creation (henceforth CKC) is referred to as a specific type of learning, intentional in nature and directed toward delivering a product (knowledge, service, or technology) (Du Chatenier et al., 2009). Four stages are central to the collaborative knowledge creation process: (1) externalizing and sharing, (2) interpreting and analyzing, (3) negotiating and revising, and (4) combining and creating. These four stages can be sequential but also can be skipped or occur concurrently.

The collaborative exchange and combination of intellectual capital\(^1\) to produce joint outputs can occur between professional knowledge workers that belong to different organizations, which can be referred to as inter-organizational learning (du Chatenier et al., 2009) and between professionals that are part of the same organization but from different departments or divisions. In the case of multiple organizations, though participants represent and embody the team, they are embedded in organizational structures and systems that differ (e.g., Pearce 2009). In the case of singular organizations, although participants may come from different functional backgrounds, they are fundamentally connected by an overarching set of norms and structures (e.g., Pearce 2009).

Multidisciplinary projects are the vehicles through which CKC can be structured. Multidisciplinary skills and knowledge input can enrich the process of collaborative knowledge creation (e.g., du Chatenier et al., 2009). Swan et al.’s study (2010) made a distinction between learning within a team and learning within a project. Swan and Scarbrough pointed out that though projects and teams frequently overlap, the characteristics of projects are not necessarily the same as the characteristics of teams. In these lines, the authors claim that project work is often very temporary, fluid, interrupted and distributed. For the sake of this paper, no distinction has been made between the terms project and team and thus, individuals that work together in a CKC project can be thought of as members of a team.

Two types of knowledge have been distinguished: explicit and tacit (e.g., Nonaka 1994). Explicit knowledge is codifiable and can be easily transferred from one person to another, frequently without

\(^1\) Consistent with the definition given by Stewart (1997), intellectual capital is referred to as intellectual material knowledge, information, intellectual property, experience and expertise that can be put to use to create wealth. For the sake of this study, the terms intellectual capital and knowledge-based resources are used interchangeably.
interpersonal interaction (McFadyen and Cannella 2004). Tacit knowledge is subjective, context specific and experience-based knowledge and is transferred through the processes of socialization and externalization (Nonaka 1994). Given that knowledge is created through interactions between tacit and explicit knowledge and not from either tacit or explicit knowledge alone (Nonaka et al., 2000, Seidler-de Alwis and Hartmann 2008) participants in CKC must exchange and combine both their explicit and tacit knowledge. Explicit and tacit knowledge are complementary, and therefore both types of knowledge are essential to the process of CKC.

The process of collaborative knowledge creation posits tasks that are reciprocal interdependent, non-routine and highly uncertain. Task interdependence (i.e., pooled, sequential or reciprocal) is referred to as the degree to which individuals need to interact to perform a specific task. For Thompson (1967), in pooled interdependence, tasks are dependent on a common pool of resources where each participant provides a discrete contribution to the whole by collating or pooling its knowledge. Sequential interdependence exists between any two tasks where one depends on completion of the previous one in order to be completed. Reciprocal interdependence exists between any two tasks where each depends on completion of the other in order to be completed. Collaborative knowledge creation consists of a set of reciprocal interdependent tasks where the timely and effective contribution of each individual is fundamental; each individual holds a potentially important piece of knowledge that is essential as it is the group that produces a conjoint deliverable (e.g., product, service).

Routineness focuses on the extent to which a task has low information processing requirements, set procedures, and stability (Jehn 1995). CKC requires substantial debate that draws on different knowledge bases; this condition increases the need for information processing capacity, as participants with diverse background are more likely to exchange opposing opinions and preferences derived from their backgrounds (Early and Gibson 2009, p146).

Uncertainty refers to as the extent in which tasks are dynamic and changing and are subject to influences that cannot be controlled or predicted (Thompson 1967). Further, Taylor and Greve (2006) pointed out that diversity in knowledge components generally involves uncertainty. For Taylor and Greve there is uncertainty about the value of each component, which as a result increases the uncertainty of the overall output, and uncertainty about the optimal way to combine components. Given that CKC relies on tapping into the diverse knowledge components or domains of the project team’s members, uncertainty is a key feature of this process.
We include in this study the pharmacy healthcare sector as an example of collaborative knowledge creation in practice. Bringing novel pharmacy care services to the market is a CKC process that involves high levels of reciprocal interdependence that poses high levels of information processing requirements as it requires the close and opportune collaboration from diverse disciplines such as supply chain management, legal, marketing, accounting and finance among others. It also faces with high levels of uncertainty due to the external environment characterized by fast-paced changes in technologies, growing global competition and time pressure for rapid innovation.

2. Challenges to successful collaborative knowledge creation

Collaborative knowledge creation draws on the knowledge of the various participants. The knowledge created is the product of interaction and constructive discussion among project members. The specific characteristics of the tasks (reciprocal interdependent, non-routine and highly uncertain) within the process of collaborative knowledge creation together with the heterogeneity of professional backgrounds have an impact on the interactions, in which individuals combine their different knowledge bases to successfully co-create knowledge.

CKC is the joint effort of individuals with heterogeneous knowledge domains that have access to a great variety of information sources. When participants fail to share it, the distribution of relevant information about a particular situation is likely to be asymmetric. We refer to it as information asymmetry.

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2 Previous studies (Gladstein 1984, Du Chatenier et al., 2009) have shown that heterogeneity in teams and task characteristics have an impact on the team members’ interactions. Gladstein’s study (1984) suggested that task interdependence and task non-routineness may influence the team’s capacity for exchanging and acquiring task-relevant information and resources.

Du Chatenier et al.’s study (2009) presented diverse factors at the team level that influence the process of collaborative knowledge creation in general. These factors were grouped in three categories: 1) emergent states, which refers to the cognitive, motivational, and effective states of teams, 2) composition inputs which is concerned with the diversity of people assigned to the team and their background and characteristics and 3) team-level inputs which refer to the opportunities given and conditions set by parent firms. The authors described how these factors influence collaborative knowledge creation in the specific context of open innovation.
While performing tasks with high levels of reciprocal interdependence it becomes difficult to assess the relative or marginal contributions of each individual (Jones 1984). Project members may perceive that contributions of certain individuals are not according to their fullest potential. We refer to it as *perceived asymmetry in resource contribution.*

CKC involves individuals from different disciplines, organizational contexts, backgrounds and personalities that increase the diversity of interpretations and perceptions about the process. For instance: individuals in interdisciplinary project teams may differ in their perceptions of fairness or equity about the same fact or event, which can affect the team performance (Cropanzano and Randall 1993). We refer to it as *perceived equity or fairness.*

CKC lies at the intersection of two or more organizational boundaries where individuals have competing loyalties and obligations to their primary organizational unit. For example, a marketing person serving on an interdisciplinary project team has strong ties to his or her home department that may conflict with the role he or she is being asked to play. We refer to it as *dual allegiance or dual commitment.*

### 2.1 Information asymmetry

This study adopts the definition used by Edmondson et al. (2003) and refers to information asymmetry as the degree to which different participants have distinct, unshared information about a particular situation. Van Offenbeek (2001) refers to information distribution as the process by which information from different sources is distributed to the members of a team. The sharing of information that is pertinent to a particular situation is of relevant importance for teams that operate in complex and dynamic environments as facilitates the development of similar team situation models (Rasker 2002). The team situation model is the team’s collective understanding of the specific situation. Cooke et al. (2000) point out that at the individual level team members acquire a specific understanding of a current situation at any point in time (i.e., a situation model). When teammates develop similar situation models they are expected to develop compatible assessments of cues and patterns in the situation, determining strategies available to the team, predicting what teammates will do and need, and selecting appropriate actions to take (Cooke et al., 2000; Cannon-Bowers, et al., 1999).

For example, providing pharmacy healthcare comprises highly knowledge-intensive tasks spread across multiple disciplines and technical specialties that are reciprocally interdependent. Rapid changes in drug development that results from technological and scientific advancements can trigger situational changes during the execution of these tasks. To perform the overall task effectively in the new situation, team members must continually interact and share information (e.g. related to his or her specialization or
functional domain) to form a coherent and accurate understanding of the new situation. A member with an engineering background is usually better informed about the technical effects of the situational change on the drug development, whereas other member with a business degree has better understanding about the economic particulars of the new situation. Participants must communicate and share information in order to establish and maintain a coordinated action to the new situation. When individuals fail to share information pertinent to a particular situation are likely to develop incompatible interpretations of the situation and to overlook plausible actions, while participants with a symmetric information distribution will have a shared understanding of the work process at any one point in time.

2.2 Perceived resource contribution

CKC is a knowledge intensive process and therefore knowledge, skills, ideas are considered as its primary resources. The process of CKC remains stable as long as resource contributions (i.e., knowledge, skills, ideas) are perceived to be in symmetry or in balance with respect to each member’s specific domain and experience (e.g., Hoegl and Gemuenden 2001). It is important to note that balance of member contributions does not mean equality of input (Hoegl and Gemuenden 2001). Depending on participant characteristics, such as the nature of their expertise or their relevant experience, some team members are likely to contribute more than others.

Participants that bring in their views and ideas in accordance to their specific knowledge and experience are perceived to contribute to the achievement of the collective goal (e.g., Hoegl and Gemuenden 2001). Because of the highly interdependent and non-routine nature of work in CKC, it becomes difficult to distinguish relative or marginal individual contributions. Jones (1984) argues that rising levels of task nonroutineness and interdependence will increase the costs of monitoring and evaluating performance, thus increasing the possibility of shirking behavior as task visibility falls. This can prompt perceptions that contributions or inputs of certain individuals are not according to their fullest potential (i.e., asymmetric contributions) and it can undermine the cooperative perspective (Mannix 1993). This study argues that perceptions of asymmetries in members contributions can negatively influence the process of CKC as this will lead to lower involvement and contributions (e.g., Mannix 1993) while on the contrary, perceptions of symmetric contributions are likely to be associated with a sense that fellow participants seek to contribute their knowledge to accomplish commonly shared goals.

2.3 Perceived equity or fairness

The various contexts and circumstances in which each individual operates influence his or her perception of equity (i.e., fairness). It is expected that the experience and professional background of each participant
will influence his or her perception of equity about the same fact or event (Cropanzano and Randall 1993). Three types of justice perceptions are generally distinguished: (1) distributive justice, which refers to the fairness about outcomes, (2) procedural justice which refers to the fairness about the process by which outcomes are allocated, and (3) interactional justice, which is concerned with the fairness about interpersonal treatments (Cropanzano et al., 2001). Along with these lines, scholars (Lind 2001, Lind and Tyler 1998) argue that these particular types of justice perceptions determine overall fairness judgments.

According to the theory of inequity aversion (Fehr and Schmidt 2001), participants involved in the collaborative process of knowledge creation are expected to be averse to inequity and inclined towards fairness. Perceived overall fairness plays a strong role in members’ disposition to share their knowledge (Yu et al., 2009) given that it is seen as a prerequisite for social exchange. This means the fairer the process of CKC is perceived to be, the higher the likelihood of social exchange and knowledge sharing among participants.

2.4 Dual allegiance or dual commitment

Interdisciplinary team members have competing loyalties and obligations to their primary functional work unit (e.g., Sachdev and Bourhis 1990, Tajfek 1982). Participants in CKC may have multiple sources of identity and be under pressure to be loyal and committed simultaneously to their functional work unit and to the project team. Competing loyalties and obligations influence individual’s knowledge sharing behavior (Husted and Michailova, 2009). This becomes problematic when the individual knowledge-sharing behavior deviates from what is optimal for CKC. An indicative symptom of such situation can be sharing too little leading potentially to an ineffective or not at all process of CKC. Knowledge-sharing decisions by interdisciplinary team members are not entirely governed or governable by the organization and functional departments; instead the personal characteristics of the individuals (Matzler et al., 2007) and the social norms established within the team (Kreiner and Schultz, 1993) play an important and influential role in the knowledge-sharing behavior. Husted and Michailova (2009) argue that individuals with high dual allegiance have a highly desirable knowledge-sharing behavior.

3. Relational coordination theory (RCT)

Thompson (1967) argued that highly interdependent tasks could be coordinated through mutual adjustment. Nevertheless, Thompson saw mutual adjustment as playing a limited role in organizations because mutual adjustment is prohibitively costly. Gittell (2010) pointed out that the nature of work has changed since Thompson introduced his theory of interdependence and has expanded the relevance of
mutual adjustment as an effective coordination mechanism for tasks characterized by high levels of interdependence and uncertainty.

RCT (Gittell 2000) is an emerging theory that reveals that coordination that occurs through frequent, high quality communication supported by relationships of shared goals, shared knowledge and mutual respect predicts a wide array of quality and efficiency outcomes in work processes that have reciprocal task interdependencies. Relational coordination consists of seven dimensions including: frequent, timely, accurate, problem-solving communication, and relationships of shared goals, shared knowledge (i.e., regarding each other’s tasks) and mutual respect. Gittell (2010a) identified a set of six high-performance work practices (HPWP) that foster the development of relational coordination such as cross-functional selection, cross-functional conflict resolution, cross-functional performance measurement, cross-functional reward systems, cross-functional meetings and cross-functional boundary spanner roles. An underlying premise in RC is that it allows interdependent individuals to better leverage and integrate their knowledge under conditions of uncertainty and time-constraint (Gittell 2002, Gittell et al., 2010a).

Relational coordination has been shown to drive positive organizational outcomes in multiple industries, including healthcare, long term care and airlines, which are characterized by high levels of task interdependence, uncertainty and time constraint (e.g., Gittell 2000, Gittell et al., 2010). Yet to be fully understood is the role of relational coordination in supporting the process of collaborative knowledge creation. It remains an open question what role relational coordination takes in the process of CKC.

There may be multiple ways in which RC can facilitate the process of CKC. Given that high levels of social capital facilitate the creation of new intellectual capital as it makes it easier to access specific resources needed (e.g. Nahapiet and Ghoshal 1998), RC referred to as a form of organizational social capital (Gittell et al., 2008) if adopted is expected to enable individuals to access and use those resources embedded in their relational coordination networks. The broad knowledge base of CKC poses increased information processing demands. RC through the network of ties provides the information processing capacity needed where knowledge and information can be processed. A variety of resources can be exchanged this way and new knowledge can be created. Additionally, RC may create the conditions in which CKC can flourish by having a positive impact on the individuals’ perceptions of equity, resource contribution, dual allegiance and information asymmetry.
4. Impact of relational coordination

As will be explained in this section, we expect relational coordination to reduce (1) levels of information asymmetry, (2) perceived inequity, (3) perceived asymmetry in resource contribution and to foster (4) high levels of dual allegiance.

![Diagram](image)

**FIGURE 1** Relational coordination, challenges and collaborative knowledge creation

High-quality relationships of shared goals, shared knowledge, and mutual respect increases information processing capacity by connecting individuals who play distinct yet interdependent roles (Gittell and Carmeli 2009). This interconnectivity will increase the exchange of information and the capacity to process it. In addition, the problem-solving communication dimension of RC avoids information hiding (Gittell et al., 2008). Along with these lines, RC is expected to increase the level and variety of knowledge that is distributed between participants in the work process. Based on these findings, this study hypothesizes that:

**Hypothesis 1**: Relational coordination is positively associated with symmetric information distribution

As stated earlier, overall fairness is determined by three-facet fairness. It has been shown that distributive, procedural, and interactional justice have relative and differential impacts on forming overall fairness.
perceptions (e.g., Lind 2001, Xu and Jiang 2009). For instance, distributive justice may have a greater impact on overall fairness judgment than the other two facets. It is not the scope of this research to explore the role of RC in influencing the perception of each facet of justice, but rather in the perceived overall fairness of CKC. Overall fairness summarizes the three facets of justice. In this context, the high-quality relationships of RC - shared goals, shared knowledge, and mutual respect - create a positive social context (Gittell and Carmeli 2008). In turn, a positive social context can help employees shape fairness perceptions and engage in organizational citizenship behavior (e.g., Xu and Jiang 2009). Along with these lines, the following hypothesis is proposed:

**Hypothesis 2**: Relational coordination is positively associated with perceived overall fairness

RC can counteract the fragmentation that arises from functional specialization (Gittell et al., 2008). Dysfunctional work relationships may lead participants to develop erratic perceptions of imbalance in resource contribution. On the contrary, high quality communication and relationships among all different participants creates an awareness of the overall work process (Gittell et al., 2008), where participants will value how individuals’ contributions fit into the overall process. The following hypothesis is proposed:

**Hypothesis 3**: Relational coordination is positively associated with perceived symmetry in resource contribution

RC facilitates quality interaction among participants in a work process and encourages individuals to listen to each other and to take account of the impact of their own actions or inactions on those who are engaged in a different part of the process (Gittell et al., 2008). Participants with high levels of RC are expected to replace a primary allegiance to their professional group with a dual loyalty or commitment and come to value others’ skills and competences. The following hypothesis is proposed:

**Hypothesis 4**: Relational coordination is positively associated with high levels of dual allegiance or dual commitment.

Relational coordination may have a direct impact on the absorptive capacity of the collaborative knowledge creation project team. Cohen and Levinthal (1990) coined the term absorptive capacity and referred to as the ability of innovating firms to assimilate and replicate new knowledge gained from external sources. Absorptive capacity is crucial in explaining why some companies are much better in tapping into external sources of knowledge. Cohen and Levinthal (1990) pointed out not only the importance of gatekeeping or boundary spanning roles for the identification and translation of external knowledge, but also the relevance of sharing this knowledge internally for collective assimilation.
Nemanich et al., (2010) conceptualize absorptive capacity at the team level as a multidimensional and multilevel construct. For Nemanich et al., the team absorptive capacity is composed of four dimensions: evaluate, assimilate, shared cognition and apply capabilities. Nemanich et al., state that the capabilities to evaluate (i.e., referred to as an accurate assessment of the most valuable external knowledge) and assimilate (i.e., referred to as learning and developing a deep understanding of valuable external knowledge) depend upon the abilities of individual team members. Nemanich et al., distinguish between individual and collective assimilation. Collective assimilation is represented by team shared cognition capability known as the ability of the team to reach a mutual understanding of external knowledge acquired by individual team members. The apply dimension is referred to as a collective capability to exploit external knowledge.

Consistent with Howell and Shea (2001), individual project team members are expected to actively scan the external environment in order to identify potentially valuable ideas, knowledge or technologies for the work process. For Nemanich et al., (2010) not all members of the team may equally access to external sources of knowledge. They underline the importance of boundary spanning individuals, as they ‘interface directly’ with external sources of knowledge. Relational coordination creates a high awareness of the overall work process, which is likely to increase the individual absorptive capacity, by allowing project team members to better recognize external knowledge with potential relevance to the work process.

Nemanich et al., (2010) pointed out that individual assimilation and collective assimilation of external knowledge involve a shift from the individual to the team. Collective assimilation can be described as a learning process of teams (e.g., Nemanich et al., 2010). In this context, the high-quality relationships of relational coordination have shown to promote learning from failures (Gittell and Carmeli 2008). Gittell and Carmeli’s study (2008) suggested that psychological safety is enhanced by high-quality relationships of shared goals, shared knowledge, and mutual respect. We argue that high levels of RC will enable team project members feel psychologically safe, which as a result would facilitate the collective assimilation of external knowledge.

Consistent with Cassiman and Veugelers (2002), we argue that internal and external sources of knowledge are complements and not substitutes to the process of collaborative knowledge creation. CKC often involves combining internal and external knowledge. Consistent with Haas (2006) we refer to external knowledge as task-related knowledge, know-how, information and feedback from outside the team boundary.
Participants with diverse organizational and knowledge background have increased exposure to unique external sources of knowledge (e.g., Cummings 2004) that if shared will enrich the knowledge base of the team as a whole. CKC benefits from diverse sources of knowledge, be it internal or external to the knowledge base of the team. CKC profits from the team’s ability to absorb and exploit new knowledge gained from sources external to the team.

Along these lines, relational coordination is expected to improve the team absorptive capacity, in particular the evaluation and collective assimilation stages. We proposed the following hypothesis:

**Hypothesis 5:** Relational coordination is positively associated with collaborative knowledge creation

**METHODS**

5. Sample and Respondents

The data analyzed in this study correspond to mid-level managers from one of the largest and leading pharmacy health care provider in Ecuador. The company provides a wide array of products and services including pharmaceutical distribution, retail pharmacy operations and pharmaceutical manufacturing. While the top management is responsible for strategic planning with respect to pharmacy operations, it is the middle managers that play a very relevant role in driving products and services implementation.

This study targeted mid-level managers that belong to four business divisions (which will be referred to as A, B, C, and D). Senior management identified middle managers with important project responsibilities for the new store development programme over the last six months. The store growth programme, a highly knowledge intensive process characterized by high levels of uncertainty and time constraints, required reciprocal iterative interactions from diverse disciplines such as supply chain management, legal, marketing, accounting and finance among others.

The mid-level manager questionnaire contained questions about relational coordination, information asymmetry, perceived overall fairness, perceived resource contribution and dual allegiance. The survey was translated into Spanish and was administered online. Surveys were completed anonymously and confidentiality was ensured. Mid-level managers were told that the survey was voluntary. We received responses from 63 out of 75 mid-level managers we attempted to survey, for a response rate of 84 per cent. Table 1 shows all variables and descriptive data. Mid-level managers that belong to the business division ‘A’ represent 19.05 percent, to the business division ‘B’ represent 17.46 percent, to the business division
‘C’ represent 44.44 percent, and to the business division ‘D’ represent 19.05 percent. Additionally, 20.63 percent of managers were less than one year in their position, 20.63 percent between one and three years, and 58.73 percent more than three years.

### INSERT TABLE 1 ABOUT HERE ###

6. Measures

Information asymmetry was measured with a self-developed 5-point scale derived from Edmondson et al., (2003). The scale consisted of two items that provided statements reflecting the distribution of situation-specific information. Respondents were able to indicate the extent to which he or she agreed with these statements ranging from ‘never’ (1) to ‘always’ (5). Factor analysis is reported in Table 1, and showed that the two items loaded onto one factor, with an eigenvalue value of 1.99 and factor loadings of 0.970. The Cronbach’s alpha was of 0.98

Perceived asymmetry in resource contribution was measured with a 5-point scale. Respondents were asked to rate whether each participant’s contribution to the overall work process was in accordance to his or her specific knowledge and experience. The scale consisted of one item. Respondents were able to indicate the extent to which they agreed with this statement ranging from ‘not at all’ (1) to ‘completely’ (5).

Perceived inequity was measured with a 5-point scale adapted from Kim and Leung (2007). Consistent with Lind (2001) overall fairness was assessed by items focusing on the individual’s global evaluation of the fairness of his or her experiences. The scale consisted of two items that provided statements reflecting general assessments of the fairness of the process of CKC. These two items are to capture much of the theoretical meaning of the perceived overall fairness. Respondents were able to indicate the extent to which they agreed with these statements ranging from ‘not at all’ (1) to ‘completely’ (5). Factor analysis is reported in Table 1, and showed that the two items loaded onto one factor with an eigenvalue of 1.57 and factor loadings of 0.884, with a Cronbach’s alpha of 0.73

Dual allegiance was measured with a self-developed 5-point scale. We found different procedures to determine dual commitment or allegiance. For example, Angle and Perry (1986) developed a 6-item scale to direct measure dual allegiance to employing organizations and to unions. In the same context, dual allegiance was additionally calculated from two separate commitment measures, one a measure of employer commitment developed by Mowday et al., (1982), and the second a measure of union
commitment developed by Gordon et al., (1980). Given restrictions for surveying mid-level managers, we developed a 3-item scale to measure dual allegiance. Two items adapted from Martin and Peterson (1987) were used to measure commitment to organizational unit and project team respectively. Martin and Peterson (1987) used 3-item measures of both union and organizational commitment, based on abbreviated versions of Gordon et al., (1980) and Mowday et al., (1982). In addition, one item adapted from Angle and Perry (1986) was used to ‘direct’ measure dual allegiance. We replaced the words ‘employer’s organization’ and ‘Local’ as originally used by Martin and Peterson, with the words ‘functional department’ and ‘project team’ respectively. These three items are to capture much of the essence of dual allegiance. Respondents were able to indicate the extent to which they agreed with these statements ranging from ‘not at all’ (1) to ‘completely’ (5). Factor analysis is reported in Table 1, and showed that the three items loaded onto one factor with an eigenvalue of 2.63 and factor loadings between 0.858 and 0.974, with a Cronbach’s alpha of 0.90

**Relational coordination** was measured using the survey developed by Gittell et al., (2010). The survey consisted of seven items that reflected the dimensions of RC i.e., the frequency, timeliness, accuracy and problem-solving nature of communication and the degree to which relationships are characterized by shared goals, shared knowledge, and mutual respect. Following procedures used in other studies of relational coordination (e.g., Gittell et al., 2008), the seven dimensions of RC were loaded onto a single factor, with an eigenvalue of 4.715 and factor loadings between 0.612 and 0.915. Cronbach’s alpha was 0.91, suggesting a high level of reliability for this measure. These indicators are reported in Table 1 and are consistent with previous studies on RC

**Collaborative knowledge creation** CKC was measured in terms of self-assessed perception of the objectives achieved over the last two months. These objectives were set in place at the beginning of the project execution. Drawing on team learning literature, team-learning leads to improved performance outcomes (Kayes and Burnett 2006). Respondents were asked to self-assess the results achieved over the last two months (whether results were ‘far worse than expected’ or ‘far better than expected’). The assumption underlying this approach was that the project represents a collective outcome of a collaborative process. Factor analysis is reported in Table 1, and showed that the four items loaded onto a single factor, with an eigenvalue of 3.63 and factor loadings between 0.8387 and 0.988. Cronbach’s alpha was of 0.95
Control variables

Control variables for challenges as manifested in information asymmetry, perceptions of asymmetry in resource contribution, perceived inequity and dual allegiance and CKC include dummy variables that indicate the functional/organizational identity of the mid-level manager. Due to their professional identities and training, different functions are expected to have dissimilar interpretations and attitudes that can have an effect on their perceptions of fairness, resource contribution, allegiance and information distribution. In addition, characteristics such as tenure might influence manager engagement in the process of CKC. The longer two managers have been in the position, the most likely they are to have established a relationship (e.g., social capital) with one another. This is likely to make it easier the creation of new knowledge. However, managers who have been in the position for a short time are more likely to come into contact with one another if they are in the same functional/organizational unit. Therefore, functional identity might also have an effect on the process of CKC. Gender and age might also influence CKC and the perception of fairness, resource contribution and dual allegiance; however they were not included on the survey.

7. Adequacy of the measures: reliability, validity and bias

The measures were assessed according to three criteria: reliability, validity and possible bias. Reliability was tested by the estimation of internal consistency (Cronbach’s alpha coefficients). The criterion of content validity was approached by the use of previously tested items and by developing items grounded in theoretical definitions. Harmon’s single-factor test was conducted to test the presence of common method effect. All variables were entered into an exploratory factor analysis; using unrotated principal components factor analysis, principal component analysis with varimax rotation, and principal axis analysis with varimax rotation to determine the number of factors that are necessary to account for the variance in the variables. More than one factor with an eigenvalue greater than one was obtained.

RESULTS

Impact of relational coordination on information asymmetry

The impact of relational coordination on information asymmetry was assessed using linear regression in STATA 10, with information asymmetry as the dependent variable. Tenure and functional identity were included as covariates for the reasons explained earlier. RC was significantly associated with information asymmetry \( (r = -0.909, p = 0.00) \). Functional identity was significantly associated with information asymmetry in the expected direction \( (r = -0.035, p = 0.00) \). Tenure was significantly associated with
information asymmetry in the expected direction ($r = 0.115$, $p = 0.00$). These findings are reported in Table 2 and support *Hypothesis 1* concerning the impact of relational coordination on the distribution of information among participants.

**Impact of relational coordination on perceived equity**

The impact of relational coordination on perceived equity was measured using linear regression in STATA 10, with perceived equity as the dependent variable. Tenure and functional identity were included as covariates. RC was significantly associated with perceived equity ($r = 0.825$, $p = 0.00$). The two covariates were not significant. These results are reported in Table 2 and support *Hypothesis 2* concerning the impact of relational coordination on the perception of overall fairness of the work process.

**Impact of relational coordination on perceived asymmetry in resource contribution**

The impact of relational coordination on perceived asymmetry in resource contribution was measured using linear regression in STATA 10, with perceived asymmetry in resource contribution as the dependent variable. Tenure and functional identity were included as covariates. RC was significantly associated with perceived equity ($r = 0.554$, $p = 0.029$). Functional identity was marginally associated with perceived asymmetry in resource contribution in the expected direction ($r = -0.047$, $p = 0.064$). These outcomes are reported in Table 2 and support *Hypothesis 3* concerning the impact of relational coordination on the perception of the contribution of knowledgeable resources to the work process.

**Impact of relational coordination on dual allegiance**

The impact of relational coordination on dual allegiance was measured using linear regression in STATA 10, with dual allegiance as the dependent variable. Tenure and functional identity were included as covariates. RC was significantly associated with dual allegiance ($r = 0.778$, $p = 0.00$). Functional identity and tenure were not significant. These outcomes are reported in Table 2 and support *Hypothesis 4* concerning the impact of relational coordination on dual allegiance.

**Impact of relational coordination on collaborative knowledge creation**

The impact of relational coordination on collaborative knowledge creation was measured using linear regression in STATA 10, with CKC as the dependent variable. Tenure and functional identity were included as covariates. RC was significantly associated with CKC ($r = 0.848$, $p = 0.00$). Functional identity and tenure were not significant. These outcomes support *Hypothesis 5* concerning the impact of relational coordination on CKC.
Given the exploratory nature of this study, the next step is to determine the extent to which information asymmetry, perceived fairness, perceived symmetry in resource contribution and dual allegiance respectively might mediate the relationship between relational coordination and collaborative knowledge creation.

The mediating effect of information asymmetry on the relationship between RC and CKC was tested using the procedures for testing mediation outlined by Baron and Kenny (1986). Consistent with the first condition for mediation, the results indicate a positive relationship between RC and CKC ($r = 0.848$, $p < .00$), a significant relationship between information asymmetry and CKC ($r = -0.783$, $p < 0.00$). Results of the regression of CKC on both RC and information asymmetry, does not provide support for the mediating effect, given that the effect of RC remained significant ($r = 0.783$, $p < 0.003$ vs. $r = 0.848$, $p < 0.00$) and the effect of information asymmetry on CKC became insignificant ($r = -0.065$, $p < 0.788$ vs. $r = -0.783$, $p < 0.00$). The results reported in Table 3 do not support the indirect effects (through information asymmetry) of RC on CKC.

The mediating effect of perceived equity on the relationship between RC and CKC was tested using the procedures for testing mediation outlined by Baron and Kenny (1986). Consistent with the first condition for mediation, the results indicate a positive relationship between RC and CKC ($r = 0.848$, $p < 0.00$), a significant relationship between perceived equity and CKC ($r = 0.673$, $p < 0.00$). Results of the regression of CKC on both RC and perceived equity, does not provide support for the mediating effect, given that the effect of RC remained significant ($r = 0.922$, $p < 0.00$ vs. $r = 0.848$, $p < 0.00$) and the effect of perceived equity on CKC became insignificant ($r = -0.089$, $p < 0.414$ vs. $r = 0.673$, $p < 0.00$). These results reported in Table 3 suggest that there are not indirect effects (through perceived equity) of RC on CKC.

The mediating effect of perceived symmetry in resource contribution on the relationship between RC and CKC was tested using the procedures for testing mediation outlined by Baron and Kenny (1986). Consistent with the first condition for mediation, the results indicate a positive relationship between RC and CKC ($r = 0.848$, $p < 0.00$), a marginally significant relationship between perceived symmetry in resource contribution and CKC ($r = 0.475$, $p < 0.06$). Results of the regression of CKC on both RC and
perceived symmetry in resource contribution, does not provide support for a mediating effect, given that the effect of RC remained significant \( (r = 0.850, p < 0.00 \text{ vs. } r = 0.848, p < 0.00) \) and the effect of perceived symmetry in resource contribution on CKC became insignificant \( (r = -0.015, p < 0.908 \text{ vs. } r = 0.475, p < 0.06) \). The results reported in Table 3 suggest that there are not indirect effects (through perceived symmetry in resource contribution) of RC on CKC.

Likewise, the mediating effect of dual allegiance on the relationship between RC and CKC was tested using the procedures for testing mediation outlined by Baron and Kenny (1986). Consistent with the first condition for mediation, the results indicate a positive relationship between RC and CKC \( (r = 0.848, p < 0.00) \), a significant relationship between dual allegiance and CKC \( (r = 0.950, p < 0.00) \). Results of the regression of CKC on both RC and dual allegiance, provides support for a partial mediating effect, given that the effect of RC remained significant \( (r = 0.242, p < 0.002 \text{ vs. } r = 0.848, p < 0.00) \) and the effect of dual allegiance on CKC remained significant \( (r = 0.769, p < 0.00 \text{ vs. } r = 0.950, p < 0.00) \). The results are reported in Table 3 and suggest a partial mediation (through dual allegiance) of RC on CKC.

### INSERT TABLE 3 ABOUT HERE ###

8. Discussion

This study is a first attempt to examine the possible relationships between relational coordination, the process of collaborative knowledge creation, information asymmetry, perceptions of overall fairness, perceptions of symmetry in resource contribution and levels of dual allegiance.

This study placed primary emphasis on the process of collaborative knowledge creation, in which knowledge is constructed through interactions. The particular nature of the tasks and the heterogeneity of knowledge have an impact on the process of collaborative knowledge creation. Factors such as information asymmetry, perceived asymmetry in resource contribution, perceived inequity and dual allegiance may limit the quality of the interactions, in which knowledge is jointly created. The results obtained in this study suggest that high levels perceptions of overall fairness have a significant effect on collaborative knowledge creation. Although CKC is not knowledge acquisition or transfer but knowledge co-creation, the results are consistent with previous studies that revealed organizational justice as a significant factor that influences knowledge-sharing intention (e.g., Ming-Tien Tsai and Nai-Chang Cheng 2011). We may argue that perceived overall fairness have a significant effect on collaborative knowledge creation, in particular on the stages of externalizing and sharing and negotiating and revising, where a collaborative behavior is critical for successfully sharing knowledge and building a mutual understanding of the knowledge.
The results also suggest that high levels of dual allegiance have a significant effect on CKC. As stated earlier, although CKC is neither knowledge acquisition nor transfer but creating knowledge collaboratively, the results are aligned with Husted and Michailova’s study (2009), which pinpoints the effects of dual allegiance on knowledge-sharing behavior. We may argue that collaborative knowledge creation benefits from high levels of dual allegiance, in particular the stages of *externalizing and sharing* and *negotiating and revising*. The stages of *externalizing and sharing* and *negotiating and revising* require a collaborative behavior and a full appreciation of the multiple perspectives held by all participants to reach a mutual understanding.

The results show that information asymmetry has a significant effect on CKC. We may argue that information asymmetry has a significant effect on CKC, in particular on the stages of *interpreting and analyzing* and *negotiating and revising*. When information asymmetry occurs, participants involved in the process of CKC may end up having too dissimilar individual interpretations to reach a mutual understanding. Along these lines, Edmonson et al.’s study (2003) suggests that when relevant information fails to surface in group discussions failure in the decision-making process can increase.

Perceived contributions can be associated with the extent to which participants are seemed to contribute to the achievement of the team goal. Participants’ perceptions of symmetric contributions had a marginally significant effect on CKC.

The results suggest that RC is an important determinant of symmetry in the distribution of information, perceived overall fairness, perceived symmetry in resource contribution and high levels of dual allegiance. We argue that collaborative knowledge creation promotes an optimal learning environment characterized by a symmetric distribution of information among participants, individual perceptions of overall fairness, resource contribution and dual allegiance.

The results also show that relational coordination has a significant effect on the process of collaborative knowledge creation. This result provides additional support for Gittell’s theory that RC allows interdependent individuals to better leverage and integrate their knowledge under conditions of uncertainty and time constraint. We suggest that relational coordination improves the team absorptive capacity and facilitates the recognition and assimilation of valuable external knowledge to the knowledge base of the team.

For new knowledge creation, individuals must devote time and effort to establish, develop, and maintain direct ties, so they can access needed resources embedded within the relationships. McFadyen and Canella (2004) pointed out the tension existing between establishing and maintaining more direct ties and
knowledge creation activities, as time and effort are required for both. In this context, this study attempts to address the question of how to manage the tension between establishing and maintaining direct ties and knowledge creation activities. In a work process characterized by high levels of RC, participants are connected by high quality communication and relationships regardless of whether or not they have strong personal ties (Gittell 2008). Therefore, participants in CKC would not rely on friendship ties but on direct ties between roles for the knowledge needed. A viable path to foster a high quality network of ties between roles constitutes the adoption of high-performance work practices (Gittell et al., 2010). By doing so, single organizations can successfully facilitate participants to establish and maintain direct ties and knowledge creation activities.

9. Limitations and further research

Given the exploratory nature of this study and the relative small sample size, results should be regarded with some caution. Dual allegiance, perceived inequity, information asymmetry and perceived asymmetry in resource contribution are ‘person-internal activities’ that are difficult to others to observe and assess and therefore in this study are based on individual’s self-assessments, which may have the potential for introducing common method variance. Following Podsakoff, MacKenzie, Lee, and Podsakoff (2003) a procedural remedy of separating the measurement of the predictor and criterion variables – proximally and methodologically- was adopted. The predictor and criterion variables were measured on different pages and were separated by unrelated questions. In addition, the sample involved highly qualified knowledge workers, which may limit generalization of findings of this study.

The results point the way towards further research in the role of relational coordination in enabling organizational learning. Though at the team level the primary goal is to collaboratively generate new knowledge, when participants represent multiple organizations, there are external factors such as levels of competition, power and dependency between the participating organizations that can have an impact either directly or indirectly on the internal group process of collaborative knowledge creation. Additional research is needed to determine what inter-organizational mechanisms must be adopted to support relational coordination, which has shown in this study to create the conditions in which collaborative knowledge creation can flourish. Further research is needed to explore the linkage between relational coordination and perceived expertise complementarity. Relational coordination may influence the perceived expertise complementarity of team members. Oosterhof (2008) refers to expertise complementarity as the extent to which team members perceive to complete each other on certain types of
expertise. Osterhof’s study (2008) found that the more team members perceived to be complementary in expertise the more they helped each other, which is critical to successfully co-creating knowledge.

REFERENCES


Ming-Tien Tsai & Nai-Chang Cheng (2011) Understanding knowledge sharing between IT professionals – an integration of social cognitive and social exchange theory, *Behavior & Information Technology*


## APPENDIX

### TABLE 1

Variables and descriptive data

<table>
<thead>
<tr>
<th>Information asymmetry ($\alpha = 0.98$)</th>
<th>Factor loading</th>
<th>Range</th>
<th>Mean</th>
<th>SD</th>
<th>N of observations</th>
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<tr>
<td>Internal business partners have distinct, unshared information.</td>
<td>0.970</td>
<td>1-5</td>
<td>3.20</td>
<td>0.50</td>
<td>63</td>
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<tr>
<td>Internal business partners take for granted or implicitly assume that others have the same information that they do</td>
<td>0.970</td>
<td>1-5</td>
<td>3.04</td>
<td>0.51</td>
<td>63</td>
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<td>Eigenvalue 1.99 Factor 1 % variance 90</td>
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<table>
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<tr>
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<th>Mean</th>
<th>SD</th>
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<td>In general, I am fairly treated</td>
<td>0.88</td>
<td>1-5</td>
<td>3.13</td>
<td>0.52</td>
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<tr>
<td>Overall, I believe I receive fair treatments</td>
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<td>1-5</td>
<td>3.35</td>
<td>0.54</td>
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<th>Range</th>
<th>Mean</th>
<th>SD</th>
<th>N of observations</th>
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<tr>
<td>It is easy to be loyal to both the functional department and project team</td>
<td>0.974</td>
<td>1-5</td>
<td>2.79</td>
<td>0.51</td>
<td>63</td>
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<tr>
<td>I feel a sense of pride being part of the project team</td>
<td>0.974</td>
<td>1-5</td>
<td>3.35</td>
<td>0.72</td>
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<tr>
<td>I am proud to tell others that I am part of my functional department</td>
<td>0.858</td>
<td>1-5</td>
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<td>Eigenvalue 2.635 Factor 1 % variance 78</td>
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<th>Perceived asymmetry in resource contribution</th>
<th>Factor loading</th>
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<th>SD</th>
<th>N of observations</th>
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<tr>
<td>Internal business partners contribute to the achievement of the project team’s goals in accordance to their specific potential</td>
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<td>1-5</td>
<td>3.67</td>
<td>0.56</td>
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<table>
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<th>Range</th>
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<th>SD</th>
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<td>Shared knowledge</td>
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<td>Mutual respect</td>
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<td>Timeliness of communication</td>
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<td>1-5</td>
<td>3.04</td>
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<td>Accuracy of communication</td>
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<td>3.11</td>
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<td>Problem-solving focus of communication</td>
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<td>1-5</td>
<td>3.49</td>
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<td>Frequency of communication</td>
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<td>1-5</td>
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Eigenvalue 4.715 Factor 1 % variance 67.3

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<td>Budget objectives</td>
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<td>2.80</td>
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<td>Major deadlines</td>
<td>0.838</td>
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<td>0.69</td>
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<td>Quality objectives</td>
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<td>2.80</td>
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<td>Objectives overall</td>
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<td>1-5</td>
<td>2.80</td>
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Eigenvalue 3.63 Factor 1 % variance 89.34

Table of correlations

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<td>3. Perceived equity</td>
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<td>4. Dual allegiance</td>
<td>0.783*</td>
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<td>0.605*</td>
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<td>-0.959*</td>
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<td>-0.774*</td>
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<td>6. Organizational identity</td>
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<td>-0.306*</td>
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<td>7. Tenure</td>
<td>0.205</td>
<td>0.229</td>
<td>0.075</td>
<td>0.183</td>
<td>-0.150</td>
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N= 63, * p< 0.05

Table of correlations

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<tr>
<td>2. CKC</td>
<td>0.843*</td>
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<td>3. Organizational identity</td>
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<tr>
<td>4. Tenure</td>
<td>0.205</td>
<td>0.207</td>
<td>0.173</td>
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N= 63, * p< 0.05
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<th>Tenure</th>
<th>Functional identity</th>
<th>Constant</th>
<th>R-squared</th>
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<tr>
<td><strong>Information asymmetry</strong></td>
<td>-0.909* (0.00)</td>
<td>0.115* (0.010)</td>
<td>-0.035 (0.000)</td>
<td>-0.011 (0.927)</td>
<td>0.899</td>
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<tr>
<td><strong>Perceived equity</strong></td>
<td>0.825* (0.00)</td>
<td>-0.091 (0.222)</td>
<td>-0.112 (0.166)</td>
<td>0.515* (0.045)</td>
<td>0.718</td>
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<tr>
<td><strong>Perceived resource contribution</strong></td>
<td>0.554* (0.029)</td>
<td>0.183 (0.253)</td>
<td>-0.047 (0.064)</td>
<td>-2.080 (0.028)</td>
<td>0.2190</td>
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<tr>
<td><strong>Dual allegiance</strong></td>
<td>0.778* (0.00)</td>
<td>0.031 (0.844)</td>
<td>0.019 (0.702)</td>
<td>-0.129 (0.650)</td>
<td>0.615</td>
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<tr>
<td><strong>CKC</strong></td>
<td>0.848* (0.00)</td>
<td>0.022 (0.795)</td>
<td>0.080 (0.297)</td>
<td>-0.265 (0.287)</td>
<td>0.703</td>
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N= 63, * p< 0.05
## TABLE 3

### Regression results for CKC, RC and Information asymmetry

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<thead>
<tr>
<th></th>
<th>Condition 1 (CKC and RC)</th>
<th>Condition 2 (CKC and information asymmetry)</th>
<th>Condition 3 (CKC, RC and information asymmetry)</th>
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<tr>
<td>Constant</td>
<td>-0.265</td>
<td>-0.181</td>
<td>-0.258</td>
</tr>
<tr>
<td>RC</td>
<td>0.848*(0.00)</td>
<td>-0.783*(0.00)</td>
<td>0.783*(0.003)</td>
</tr>
<tr>
<td>Information asymmetry</td>
<td>0.080 (0.297)</td>
<td>0.503 (0.542)</td>
<td>0.706 (0.389)</td>
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<tr>
<td>Functional identity</td>
<td>0.229 (0.795)</td>
<td>0.132 (0.169)</td>
<td>0.302 (0.533)</td>
</tr>
<tr>
<td>Tenure</td>
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### Regression results for CKC, RC and Perceived equity

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<th>Condition 2 (CKC and Perceived equity)</th>
<th>Condition 3 (CKC, RC and Perceived equity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.265</td>
<td>-0.627</td>
<td>-0.219</td>
</tr>
<tr>
<td>RC</td>
<td>0.848*(0.00)</td>
<td>0.673*(0.00)</td>
<td>0.922* (0.00)</td>
</tr>
<tr>
<td>Perceived equity</td>
<td>0.080 (0.297)</td>
<td>0.079(0.479)</td>
<td>-0.089 (0.414)</td>
</tr>
<tr>
<td>Functional identity</td>
<td>0.229 (0.795)</td>
<td>0.175(0.095)</td>
<td>0.069 (0.375)</td>
</tr>
<tr>
<td>Tenure</td>
<td></td>
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<td>-0.014 (0.386)</td>
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### Regression results for CKC, RC and Resource contribution

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<tr>
<td>Constant</td>
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<td>~2.016</td>
<td>-0.209</td>
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<td>RC</td>
<td>0.848*(0.00)</td>
<td>0.475(0.068)</td>
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<td>Resource contribution</td>
<td>0.080 (0.297)</td>
<td>-0.069(0.588)</td>
<td>-0.015(0.908)</td>
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<tr>
<td>Functional identity</td>
<td>0.229 (0.795)</td>
<td>0.188(0.205)</td>
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<td></td>
<td></td>
<td>0.025(0.783)</td>
</tr>
</tbody>
</table>

### Regression results for CKC, RC and Dual allegiance

<table>
<thead>
<tr>
<th></th>
<th>Condition 1 (CKC and RC)</th>
<th>Condition 2 (CKC and Dual allegiance)</th>
<th>Condition 3 (CKC, RC and Dual allegiance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.265</td>
<td>-0.146</td>
<td>-0.165</td>
</tr>
<tr>
<td>RC</td>
<td>0.848*(0.00)</td>
<td>0.950*(0.00)</td>
<td>0.242* (0.002)</td>
</tr>
<tr>
<td>Dual allegiance</td>
<td>0.080 (0.297)</td>
<td>0.023(0.453)</td>
<td>0.769* (0.000)</td>
</tr>
<tr>
<td>Functional identity</td>
<td>0.229 (0.795)</td>
<td>0.035(0.412)</td>
<td>0.055(0.008)</td>
</tr>
<tr>
<td>Tenure</td>
<td></td>
<td></td>
<td>0.0080(0.828)</td>
</tr>
</tbody>
</table>