

## Knowledge sharing behavior in research projects between scientists

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### **Abstract:**

Through proper knowledge management effective interaction and knowledge sharing is facilitated on projects in which multiple institutions cooperate, and which frequently are of international character. In this manner best scientists and researchers from around the world are joined together to solve complex problems and generate knowledge valuable for innovating. In this study knowledge sharing behavior of scientists and factors affecting behavior were explained in the context of international research projects.

The purpose of the investigation was to identify and explain relationships of factors significant for individual knowledge sharing in project teams characterized by geographic dispersion, electronic dependence, dynamic structure and national diversity of its members. In the attempt to do so we found that competitiveness has also been found as a personality traits associated with eagerness to share knowledge and is enhanced by transformational leadership climate. Finally, sharing of explicit and tacit knowledge contributes to team performance. Along with these findings, integration of relevant psychology, sociology and organizational theories in the knowledge sharing context is a major contribution of the research.

**Key words:** knowledge sharing, theory of planned behavior, personality traits, transformational leadership climate, team performance

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### **1. INTRODUCTION**

A “knowledge-based view of the firm” (Dyer & Nobeoka, 2002), indicating knowledge is the most important organizational resource has emerged in recent years. Scholars suggest that the key role of the firm is in creating, storing, and applying knowledge (Kogut & Zander, 1992; Conner & Prahalad, 1996; Grant, 1996). Knowledge has been recognized as a driver of innovation and a strategic asset for achieving market success. Additionally, the importance of knowledge lies in the fact that the capability to innovate is considered a primary source of any organization’s sustained competitive advantage (Lengnick-Hall, 1992; Porter, 1990).

In today’s worldwide competition it is extremely difficult for a single actor to innovate effectively due to the risks involved and resources required. Therefore, systems based on close collaboration are frequently created to adapt to this newly developed context. Formation of clusters between firms, close cooperation of research institutes and universities, creation of research and development zones help organizations enhance the knowledge base, ultimately driving innovation. One of the most significant processes which influences team performance, cohesion, knowledge integration, decision satisfaction (Mesmer-Magnus et al., 2009) and work-environment creativity (Schepers & van den Berg, 2007) is knowledge sharing. Employees contribute to the knowledge base, innovativeness, competitiveness (Jackson et al., 2006) and success of their organization and projects (Adenfelt, 2010) by sharing their knowledge. However, attaining conditions, which would fuel knowledge sharing process, is not an easy task. This requires development of initiatives that support knowledge sharing appropriately, that were created based on deep understanding of critical aspects of the sharing process, such as various knowledge management practices, environmental factors and characteristics inherent in the individuals themselves. Through creation of policies that facilitate effective interaction among actors of an innovation system and relevant knowledge flows on the macro level, and by fostering knowledge exchange on a micro level, organizations are making knowledge their main resource for improving competitiveness. Only through effective knowledge sharing between various institutions within innovation systems and between individuals can the knowledge base be increased. Individuals within these institutions should share their knowledge freely and openly without the fear of losing unique value or other barriers hindering the process. This study aims at investigating knowledge sharing between scientists in project teams and explaining associations of individual level factors affecting knowledge sharing.

Knowledge sharing is considered to be a type of organization citizenship behavior, and as such is frequently ignored by organizations. It is excluded from the job descriptions, as it is not a formal part of organization and team activities. Nevertheless, its role is crucial for teams, projects' and organizations' success. For instance, there was a positive relationship found between knowledge acquisition variables and financial and non-financial team performance, especially with a communication understanding component (Politis, 2003). Therefore, knowledge sharing deserves more attention in research and management practice.

Moreover, in knowledge-based organizations project teams are usually constructed to work on complex tasks (Cummings, 2004; Rico et al., 2008), playing an important role in achieving organizational goals. Knowledge sharing that takes place among team members is a process of great relevance that builds ties and relationships, which in turn enhance team performance. Knowledge workers in such teams participate in intensive knowledge tasks, solving complex problems, through collaborative efforts. They tend to be highly educated, demonstrate flexibility, initiative, and higher job performance (Stewart, 1997; Davenport & Prusak, 1998). In order to apply appropriate knowledge management practices to a specific setting, first an understanding of psychological mechanisms of individuals in the context of behavior needs to be achieved.

A problem of shaping the external environment to facilitate knowledge sharing without truly knowing the individual is a major concern for the research of knowledge sharing. Generic suit-all management initiatives are created, often failing to produce desired outcomes. Therefore, an inside-out approach should be taken in investigating knowledge sharing. Characteristics of individuals should be taken into consideration when applying mechanisms aimed at facilitating knowledge sharing. Explaining the relationship between personality and attitude in the context of knowledge sharing will result in a better understanding of factors which should be nurtured within individuals. Accordingly, distinct management initiatives need to be developed to suit these factors. A more particularistic application to suit the individual, in the domain of leadership, staffing decisions, work organization and incentive systems is required to generate knowledge sharing. Therefore, we start exploring the minds of scientists working on international projects of high academic and economic value.

However, even among scientists, who are assumed to share their knowledge freely, as they are engaged in knowledge intensive activities that require close cooperation, certain barriers, reflecting the surrounding environment that does not foster positive characteristics and natural principles of science, may exist. Occasionally in the dynamic working environment characterized by geographic dispersion, electronic dependence, dynamic structure and national diversity of its

members (Gibson and Gibbs, 2006) complications occur. In such working environments due to the cultural diversity, language obstacles, task organization, shortage of face-to-face interaction and physical distance, there is a lack of shared identity, sense of belonging and trust in others (Au and Marks, 2012). Consequently, misunderstanding and conflict between team members follow (Richards & Bilgin, 2012), in turn hindering knowledge sharing. Still, scientific collaboration entails close cooperation and knowledge sharing, and so it can present a benchmark on knowledge sharing for other project and organizational teams.

Another issue that the study addresses pertains to the context in which the teams under the investigation are embedded. By choosing a sample of research projects of strategic value for the governments, we are aiming to build awareness of the state and operations of these projects; transfer lessons learned and build a foundation for the development of target specific knowledge management practices.

This study addresses the need to do so as sharing of knowledge in the project team environment has not been investigated much. Often projects lack management initiative facilitating such actions as knowledge sharing between team members. Furthermore, there is a general lack of understanding of individual factors salient for knowledge sharing behavior to occur, that's why the research questions are formed considering the context of the investigation:

- Which factors influence tacit and explicit knowledge sharing?
- How does team performance of scientists depend on sharing of tacit and explicit knowledge?
- What are the main attributes of projects, scientists and their behavior during research projects?

### **2. Background of the study**

The study considers the wider macroeconomic context represented by the National Innovation System, role of the government and specific project features in which individual knowledge sharing is embedded. Innovation policy is a core policy for the strategic development and economic growth. Governments' efforts to create measures which enable the integration of Science and Technology within the wider social and institutional context, positioned National system of innovation as one of the major tools for bringing national economies one step closer to the knowledge-based economies.

Since the concept of National systems of innovation has been introduced by the works of Freeman, Lundvall and Nelson in the mid-1980s (Freeman 1987, 1988; Nelson 1988, Lundvall, 1988) it has been given a significant role by policy makers in the process of fostering innovations. National Innovation System represents a

framework for analyzing national science and technology policy. One of the key roles of the government is to provide a setting for institutions to interact effectively and contribute to the NIS.

This entails providing adequate support in terms of financing, creating favorable policies and facilitating cooperation between various institutions.

When it comes to project work on the international S&T projects between various institutions, it is usually done by non-traditional working entities created to respond to recent knowledge challenges. Generating a perfect knowledge-sharing environment in these types of conditions might pose a difficult task. Frequently, diverse virtual teams are created to work on projects and respond effectively to the knowledge challenges their organizations face. Advantages to forming such teams may include reduction in travel and cost, recruitment of geographically dispersed talented employees, building diverse teams with specific knowledge and ties of team members, promoting employment in different areas, reduction in discrimination and promoting proactive employment practices for disadvantaged individuals and groups (Bergiel et al., 2008).

On the other hand, working environments that do not align with some employees' psychological traits, lack of face-to-face interaction, difficulties in establishing team identity, cultural and temporal differences, complex technological applications and operational environment unfit for company's organizational culture are all challenges that need to be met in order to enable effective knowledge sharing (Gibson and Gibbs, 2006). Therefore, "virtuality" itself can be both a threat and an opportunity for promoting effective knowledge sharing between individuals. For the significant S&T projects, governments sometimes provide funding in order to increase the mobility of scientists and ensure there is sufficient face-to-face contact needed for effective knowledge exchange.

Knowledge sharing that occurs between team members working on S&T projects that are a subject of our study encompasses both sharing of explicit knowledge such as information, data, product samples, materials, equipment and instruments; as well as tacit knowledge embedded in people and facilitated through the exchange of team members and other technical experts of global teams.

By gaining access to expertise, ideas and information that are not available locally to project team members, they will benefit greatly by enhancing their knowledge base, which in turn will drive innovation. Through face to face communication, electronic networks and other information technology it will be possible to exchange knowledge essential to the success of the project. When it comes to distributed research and development process (Ahuja & Gautam, 2000) and teams whose members are geographically spread; properly utilized electronic networks

enable knowledge flows and other computer mediated communication tools.

It is apparent that the project teams which are a subject of our study function amidst specific circumstances, characterized by diversity and dynamism. Additionally they have a significant role in their organizations and the innovation system. Understanding the background of the study helps us better interpret the results, and allows us to meaningfully discuss the implications of the findings.

### **3. Understanding the concept of knowledge sharing**

A number of perspectives and research approaches were taken in examining knowledge sharing on multiple levels. In past studies organizations, headquarters and subsidiaries, various business units, departments (Yang & Chen, 2007; Zander & Kogut, 1995; Szulanski, 1996), teams and individuals were investigated in the context of knowledge sharing. Cooperation, interactive learning and knowledge sharing within the institutional setting is essential for achieving positive organizational outcomes.

For example, in the context of National systems of innovation, organizations and institutions directly related to searching, generation, diffusion, and appropriation of knowledge and technological innovations, such as R&D departments, universities, and research institutes (Chung, 2002) collaborate on projects and participate in knowledge transfer processes. Consequently, firms that share knowledge with the actors of innovation system have higher innovative performance than the firms, which do not share knowledge (Spencer, 2003). On the other hand, interacting only with their national innovation system earns lower innovative performance than interacting with the global innovation system (Spencer, 2003). Knowledge management practices should therefore be implemented on all levels to ensure positive outcomes.

Knowledge transfer is a voluntary process that happens between knowledge source and a recipient where both of parties actively participate in the process of sharing, consisting of knowledge provision by the knowledge source and the absorption of the knowledge by the recipient. In his research, Szulanski investigates internal stickiness (Szulanski, 1996), and finds that one of the barriers to internal knowledge transfer of the best practice is arduous relationship between the source and the recipient. In order to improve the collaboration between macro actors, facilitating effective interaction between individuals should be targeted, given that all knowledge sharing fundamentally is a matter of interaction between people. Therefore, individual knowledge sharing is a prerequisite for knowledge transfer to occur.

Individual level knowledge sharing is considered to be a significant process resulting in positive organizational outcomes, such as superior innovation capability, work-environment creativity (Schepers & van den Berg, 2007), team performance and decision satisfaction (Mesmer-Magnus et al., 2009). Accordingly, individual knowledge sharing has justifiably held an important position and hence has been a

subject of many studies in the field of knowledge management. In those studies, knowledge is usually divided into two types: explicit and tacit. Explicit knowledge customarily refers to the type of knowledge that can easily be communicated with words, codified and subsequently shared. Explicit knowledge is easy to capture and comes in a somewhat tangible form, generally as documents, presentations, manuals, etc. Sharing of explicit knowledge is usually being facilitated by information technology.

Tacit knowledge or know-how (Kogut & Zander, 1992; Grant, 1996;) on the other hand, is related to an individual's experience and thoughts (Alavi & Leidner, 2001) and is subject to social interaction (Käser & Miles, 2002; Nonaka, 1994) and friendship (Osterloh & Frey, 2000). In the context of project work team members' sharing of tacit knowledge is reinforced in situations in which they interact face-to-face (Howells, 1996). Geographical proximity of team members, common language and mutual trust all affect the level of tacit knowledge utilization on projects, which can in turn affect team performance (Koskinen, 2003).

According to the SECI model, illustrating knowledge creation, developed by Nonaka and Takeuchi, a nonstop interaction between individuals occurs in which knowledge is being continuously converted from tacit to explicit and from explicit to tacit. SECI process is comprised of four knowledge creation modes characterized by different conversion processes: socialization (tacit to tacit), combination (explicit to explicit), externalization (tacit to explicit), and internalization (explicit to tacit).

As tacit knowledge is internal, and embedded in people, human interaction is essential for its transfer. Subsequently tacit knowledge in the form of experience or skills is transferred between individuals in the socialization process. Externalization, on the other hand is a process of making tacit knowledge explicit. For example, organizations attempt to capture employees' knowledge through creating platforms, such as internal forums for communities of practice, where employees can interact and exchange knowledge. Through synthesizing, evaluating and filtering the body of knowledge the process of externalization might be partially successful.

Early knowledge management practice and research have mostly been focused on managing explicit knowledge in forms of documents, forms, procedures , etc., thus creating huge repositories of knowledge, relying on IT to facilitate knowledge sharing processes, and to enhance the collective memory of an organization. However the assumption that technology for knowledge sharing being implemented, will lead employees to share knowledge has shown to be false, as it often failed to make tacit knowledge explicit. Technology itself often fails to capture the most important component of knowledge, the tacit one, due to its cognitive nature (Pawlowski & Robey, 2004). Consequently, in addition to technology there are various factors that

have a significant impact on knowledge sharing. A thorough literature review of factors influencing both sharing of tacit and explicit knowledge has been conducted in the next sections.

### **4. Critical success factors influencing knowledge sharing**

As it is a core process of knowledge management, a number of studies have explored knowledge sharing on organizational, team and individual levels. This study examines and explains individual knowledge sharing. Factors influencing knowledge sharing of individuals in organizations and virtual communities have extensively been examined in knowledge sharing literature. In order for individuals to effectively share their knowledge with others, certain factors exerting their influence should be present. Organizational (McDermott, 2001), team (Phillips et al., 2003; Cummings, 2004), and individual context factors (Kamdar et al., 2004; Cabrera & Cabrera, 2005; Chen et al., 2009) are conducive to creating a knowledge sharing environment and driving knowledge sharing among individuals.

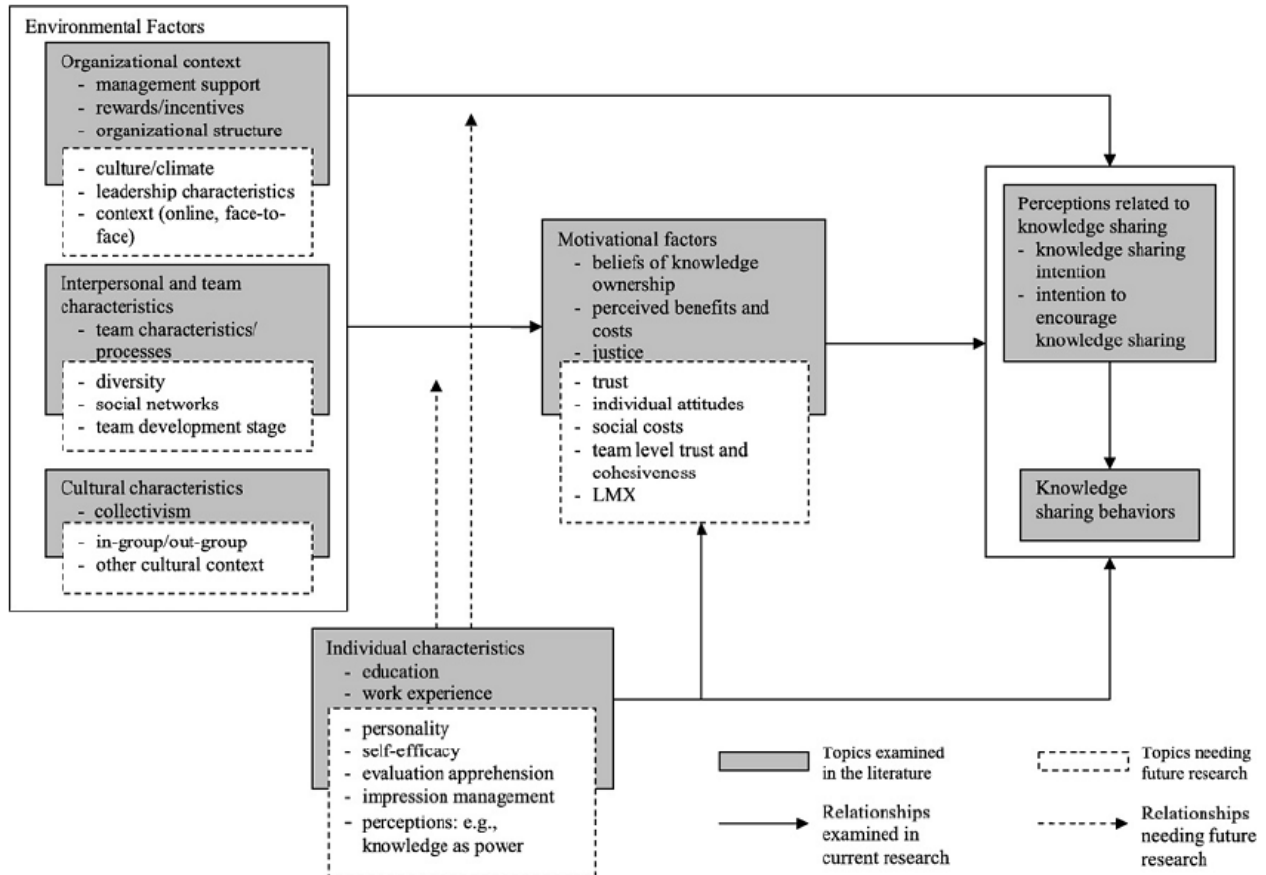
In recent years a perspective emphasizing that knowledge is tacit, embedded in people, socially determined and related to daily practice has emerged (Cook & Brown, 1999; Lin, 2007; Gangi et al., 2012). Subsequently, a notion arose that knowledge sharing can only be encouraged and not forced as it resides individuals who are either motivated externally or have the intrinsic desire to share knowledge.

Previous studies have explored and discussed various factors facilitating and hindering knowledge sharing of individuals. In their comprehensive review of knowledge sharing literature, Wang and Noe (2009) identify five areas of research and the respective factors influencing individuals' knowledge sharing behavior. Organizational context, cultural characteristics, interpersonal and team characteristics, individual characteristics, and motivational factors are significant in enabling and leading to knowledge sharing behavior (Wang & Noe, 2010). Comprehensive literature review framework encompassing these contexts is displayed in figure 4-1. Many of the factors belonging to contexts in question are inter-related and by interacting effectively, they produce a desired outcome. The organization's knowledge base is enriched when individuals provide relevant knowledge that after being accepted contributes to the collective memory of the organization.

Knowledge creation process in organizations depends on individuals sharing their knowledge with others (Nonaka & Takeuchi, 1995). Therefore, a deeper understanding of individual level knowledge sharing needs to be achieved. Individual is in the center of a complex set of factors, which either enable knowledge sharing behavior or hinder it, depending on how they are managed. By examining current knowledge management literature three key contexts and their respective factors which

interact to generate knowledge sharing behavior are identified. Organizational, team and individual context factors are all relevant in leading to a favorable outcome, when knowledge is provided by the source and accepted by the recipient.

**Fig.4.1.** A framework of knowledge sharing research



Source: Wang and Noe, 2010

#### 4.1 Organization context factors

Organizational context, predominately organizational culture is considered to be an important element of an environment facilitating knowledge sharing of individuals in organizations, virtual communities and on projects (Chen & Cheng, 2012; Al-Alawi et al., 2007). The nature of the organization and an effective knowledge management system (KMS) can lead the individuals to share their knowledge (King & Marks Jr., 2008). Contributing knowledge to knowledge platforms, such as KMS, and direct sharing between individuals are both significant for organizations' and projects' success.

Organization level factors refer to the way organizations are structured, the organization-individual interaction that is influenced by the organization culture and the infrastructure provided which is the basic requirement for knowledge sharing to

occur. Organizational support and processes, values, leadership, climate, incentives, information technology, structural diversity are all organization context factors relevant in facilitating individual's cognitive processes that impact knowledge sharing behavior.

### *(1) Leadership and management support*

Leadership is a salient factor influencing knowledge sharing (Søndergaard et al., 2007). Empowering leadership not only leads to knowledge sharing, but also positively influences efficacy, consequently leading to better team performance (Srivatava et al., 2006). Another important characteristic that can be attributed to a leader is fairness. Through fair treatment of employees, a leader can evoke a cognitive state, which may lead to positive behaviors and outcomes. By affecting social exchange relationships of supervisors and organization with the members, procedural and interactional justice influence organization citizenship behavior of team members and supervisory and organizationally relevant outcomes (Rupp & Cropanzano, 2002; Schepers & van den Berg, 2007). Moreover, supervisory control has exhibited influence on contribution frequency and effort of individuals to contribute to the KMS (King & Marks, 2008). For these reasons leadership is a factor that plays an important role in affecting individuals' cognitive state and helps in sharing knowledge and contributing to KMS.

### *(2) Structural diversity*

Hierarchical organizational structures have a negative influence on knowledge sharing by inhibiting proper functioning of social networks (Seba et al., 2012). Furthermore, knowledge sharing within teams and between the line organization and teams is influenced by hierarchy reflected in rank and age of employees, organizational context, micro-politics and suspicion. Often special project teams are created by organizations under the assumption that knowledge flows and innovation can be generated by stepping away from the dominant culture of the organization. However, despite an independent project teams being constructed to drive innovation, cross-disciplinary, cross-functional and cross-hierarchical design of the teams as well a cultural imprint of the line organization can present a barrier to successful knowledge sharing (Friesl et al., 2011).

### *(3) Values*

Values are at the core of organizational culture, and are regularly mentioned by larger organizations which recognize their significance in shaping organizational culture. However, just by being advocated and communicated through other more visible aspects of organizational culture these values do not necessarily lead to the desired behavior of the employees. It is through the process of espousment and enactment by the organization and through the internalization by the individual, that

values, such as dialogue can affect knowledge sharing behavior (Michailova & Minbaeva, 2012). Additionally, values are seen as an important driver in the use of information technology in sharing knowledge (DeLong and Fahey, 2000). When organizations emphasize trust (Kankankhalli et al., 2005; Chiu et al., 2006; Liao 2006), learning (Taylor & Wright 2004; Hsu, 2007), innovation (Bock et al., 2005) and cooperation (Wang, 2004) individuals are more inclined to share knowledge.

#### *(4) Incentives*

In some instances, rewards were found significant in promoting knowledge sharing behavior (Al-Alawi et al., 2007; Weir & Hutchings, 2005; Kim & Lee, 2006). Extrinsic rewards, such as higher pay, bonus and promotion exert positive influence on frequency of knowledge contribution to knowledge management systems (Kankankhalli et al., 2005). On the other hand, individuals' knowledge-sharing attitudes were also negatively affected by anticipated extrinsic rewards (Bock & Kim, 2002). In electronic communities individuals share knowledge primarily out of community interest, generalized reciprocity and pro-social behavior, and not various tangible and intangible returns whereas, when knowledge is approached as organizational or individual property, sharing is motivated by narrow self-interest (Wasko & Faraj, 2000).

As research on rewards has been inconclusive both individual-based and collective-based rewards should match the organizational and social context of the organization, project team and the individual.

#### *(5) Information technology*

In the study of organizational culture factors influencing knowledge sharing within organizations in public and private sectors in Bahrain, information systems have been proven relevant in facilitating knowledge sharing (Al-Alawi et al., 2007). However, when organizational values are not supportive of knowledge sharing new technology has a limited effect (Wasko & Faraj, 2000).

Most of the studies prove that technology is a tool facilitating the process of knowledge sharing. However, regardless of effectiveness and ease of use being important factors in utilizing technology (King & Marks, 2008) still the sheer existence of it does not lead to knowledge sharing. Other factors need to be in place in order for the technology to be of use (Siakas et al., 2010). Taking a more fragmented nature of project tasks and diversity of teams into account is essential, (Zakaria & Talib, 2011) as it is ineffective to create an environment to fit the technology.

In other words, project characteristics, such as geographical dispersion, scope, industry, temporal dimension, together with the personality, nationality, age etc. of the team members should determine the type of technology to be utilized. Therefore, a more adaptive technological approach should be considered.

### 4.2 Team context factors

#### *(1) Social capital*

As work in organizations and on projects is highly interdependent collaboration is a part of daily work. Individual's knowledge when shared with others becomes more valuable, as it grows into a part of collective memory of an organization. One theory that has been widely accepted and used in examining knowledge sharing in both organizations and virtual communities is social capital theory. Relational, cognitive and structural dimensions of social capital encompassing interaction ties, network features, trust, reciprocity norm, identification, shared vision and shared language were found to influence quality and quantity of knowledge sharing in organizations and virtual communities (Chiu et al., 2006; Wu et al., 2007; Kane et al., 2005; Nahapiet & Ghosha, 1998). In their research of knowledge sharing in electronic networks of practice Wasko and Faraj found that a more central position in a network positively impacts knowledge sharing and that reciprocity and commitment to the network influence knowledge sharing when individuals perceive that sharing of knowledge enhances their professional reputation, and because it is enjoyable for them to share knowledge (Wasko & Faraj, 2005). However, the influence of reciprocity and commitment is not strong, suggesting that virtual community context is more affected by a different form of reciprocity and trust development process. Research also suggests that team membership has the largest effect on the density of knowledge sharing (Bakker et al., 2006) and that people obtain useful knowledge from their strong ties, which are formed when interacting closely and frequently (Levin et al., 2002). Weak ties are also significant as they provide access to non-redundant information (Levin et al., 2002). Due to the temporary nature of projects, there is a lack of shared identity and trust and a large number of weak ties might exist between team members.

#### *(2) Trust*

Role trust plays in making both provider and recipient of knowledge to expose themselves to uncertainty has been emphasized in the literature. Competence-based trust and benevolence-based trust are important factors both for the provision and the receipt of knowledge between employees (Levin et al., 2002; Abrams et al., 2003). Furthermore, trust development which ultimately leads to knowledge sharing can be seen as a sequential and interdependent process. First, economy-based trust needs to exist for information-based trust to be developed which finally might lead to identification-based trust is associated with knowledge sharing behavior (Hsu et al., 2007).

Additionally, trust in management enhances knowledge sharing through reducing fear of losing one's unique value and improving willingness to document knowledge

(Renzl, 2008). On the other hand, trust was also found to be a poor explanatory of knowledge sharing (Bakker et al., 2006). On occasion, due to the nature and organization of work sufficient time for the trusting relationships to be cultivated is lacking. Hence, as proposed by several studies, besides trust other psychosocial factors essential in creating a psychologically pleasant environment should be included in the research on knowledge sharing behavior.

*(3) Diversity*

In addition to the social capital factor residing in teams' inter-relationships, characteristics rooted in the diversity of its members are relevant in influencing knowledge sharing behavior of individuals. Diversity encompasses differences in professional background, personality of team members, national culture, tenure and many other team member characteristics. Cummings argues that when groups are more structurally diverse, namely when employees are located on many geographic locations, more managers there are to report, more function and business units work group members belong, larger is the effect of external knowledge sharing on their performance (Cummings, 2004).

In a controlled experiment, influence of congruent and incongruent ties on knowledge utilization was examined. Findings suggest that when group members with social ties share same information and stranger possesses unique information a more positive effect on information utilization is exerted than in groups with incongruent social and knowledge ties. However, when sub-groups within congruent and incongruent groups were of the same size, performance was the same implying dependence of decision-making and knowledge sharing on the group composition (Phillips et al., 2003) and the significance of the diversity factor.

*(4) Cooperation and competition*

Cooperation and communication between team members and the discussion structure enhance knowledge sharing while: information distribution, informational interdependence, and member heterogeneity defer team members from sharing knowledge (Mesmer-Magnus et al., 2009). Coopetition theory and social capital theory were used by Baruch and Lin to establish a knowledge sharing model exhibiting that the influence of social capital namely, trust, social interaction and shared vision, together with team politics on knowledge sharing is positively mediated via cooperation and negatively through competition (Baruch & Lin, 2012).

### **4.3 Individual context factors**

Ultimately, it is up to individuals to share or not to share knowledge. The cognitive dimension is crucial in determining their behavior. For that reason organizational and team context factors in interaction with individual's cognition influence the voluntary act of knowledge sharing. Consequently, individual knowledge

sharing in organizations, virtual communities and on projects has been explored. Attitude, subjective norm, intention, trust, self-efficacy, outcome expectations, goal orientation, personality, perceived behavioral control and emotions are significant factors explored through existing sociological and psychological theories applicable for explaining knowledge sharing behavior of individuals.

In prior studies attitude and a subjective norm were used to explain knowledge sharing by using knowledge sharing intention as an indicator of knowledge sharing behavior (Ryu et al., 2003; Chen et al., 2009). However, intention has sometimes failed as an indicator of knowledge sharing behavior due to organizational context barriers such as mistake-free culture and tendency of others to deliberately misinterpret sharing, which may cause negative consequences to the knowledge source. Control beliefs that reflect people's capacity that may overcome such environmental obstacles are therefore suggested to be explored (Kuo & Young, 2008).

A positive impact of job attitude encompassing job involvement and job satisfaction on knowledge sharing has been found (Teh & Sun, 2012). Furthermore, attitudes of eagerness and willingness exert positive influence on the intention to share knowledge. Emotion of pride influences knowledge sharing intention via both willingness and eagerness showing both ego-focused and other-focused elements while the emotion of empathy influences knowledge sharing intention only through willingness (Hoof et al., 2012).

By applying Social cognitive theory Hsu and Ju found that knowledge self-efficacy has both direct and indirect effect on knowledge sharing and on community and personal outcome expectations, and in turn those personal outcome expectations have influence on knowledge sharing (Hsu et al., 2007). Self-efficacy has been a strong explanatory factor of knowledge sharing in many studies (Quigley et al., 2007). Particularly, a strong correlation was found between performance goals and the recipient's self-efficacy when recipient of knowledge trusted the provider (Ibid, 2008).

To a great extent it depends on the personality of individuals how they will react to outside stimuli. In recent year, personality has been studied more extensively and significant relationship was found between the personality traits and knowledge sharing within teams (Matzler et al., 2008). In another study utilizing a vignette based experiment Kamdar finds that high and low self-monitors share knowledge differently depending on which type of incentive they expect to receive (Kamdar et al., 2004). Additionally, openness of individuals to experience (Cabrera & Cabrera, 2005), emotional intelligence (Chen et al., 2009) and exchange ideology (Lin, 2007) have exerted influence on knowledge sharing. Due to the fact that individuals are predisposed for certain attitudes and behaviors, different aspects of personality when combined with proper factors may lead to knowledge sharing.

National culture is another factor that has evoked interest in the research community in recent years. Findings show that cultural interpretations of knowledge sharing practice help in explaining culturally specific conceptions and applications of knowledge sharing at multiple organizational levels and suggests that western notions could be misleading when followed in promoting knowledge sharing in non-western context (McAdam et al., 2012; Huang et al., 2008). For instance, cultural differences in terms of socialization, externalization, combination and internalization between Arab and Chinese culture were explored emphasizing the importance of personal networks and demonstrating that sharing knowledge can be facilitated only by relationships based on trust, which in these societies takes a long time to develop (Weir & Hutchings, 2005).

Additionally, more individualistic and universalistic cultures, such as North American culture, participate in knowledge sharing for the feeling of self-worth (Jiacheng et al., 2010). On the other hand, Chinese engage in knowledge sharing to attain group harmony and positive result, avoid conflict, save face of group members and managers, whereas Russians do so for the desire to dominate the group and self-interests (Michailova & Hutchings, 2006).

Extensive literature review describes many approaches and frameworks utilized in explaining knowledge sharing behavior. Individual context factors need to be considered when examining factors belonging to organizational and team context. An inside-out approach to fostering knowledge sharing behavior by cultivating atmosphere and generating knowledge management initiatives to suit individuals should be taken. Hence, individual context factors deserve more attention by both the research community and practice. Next, theories encompassing some of these individual context factors relevant for the construction of the research model are reviewed.

### **5.Theory of reasoned action:**

Theory of Reasoned action, developed by Ajzen and Fishbein (Fishbein & Ajzen, 1975) has been recognized as one of the most influential theories of human behavior. According to their theory, human behavior is influenced by the intention to execute this behavior, and the intention forms under the impact of attitude toward the behavior, i.e., evaluation of the behavior itself as being favorable or unfavorable, and the subjective norm, i.e. the evaluation of the behavior by others. In other words, a positive attitude

toward a behavior together with a positive subjective norm forms individual's intention to engage in the behavior, and in turn results in performance.

According to the Theory of Reasoned action intention to engage in a behavior is a good predictor of the behavior itself. The main assumption of the theory is that the behavior is under the volition of the subject, meaning that the subject has control to perform or not to perform a certain behavior (Ajzen & Fishbein, 1977). This, however, is the theory's biggest limitation. Therefore, through the past 40 years of research on this subject many theories and efforts to improve and refine the theory of reasoned action in order to construct a better

explanatory theory of human behavior have been exerted. Theory of Planned Behavior that building on the Theory of reasoned action filled in the existing theoretical gaps.

Theory of reasoned action has been confirmed through extensive research as attitudes and subjective norm have exhibited strong relationship with intentions to engage in a specific behavior in many empirical studies, and so did the intention in relation to the performance of the behavior (Ajzen, 2001; Fishbein & Ajzen, 1977; Taylor & Todd, 1995). For example, there is an average correlation of .53 between intentions and behavior in a meta-analysis of 87 studies (Sheppard et al., 1989). The Theory of Reasoned Action has also been extensively applied in knowledge management research with attitude, subjective norms and knowledge sharing intentions exhibiting significance in relationship to knowledge sharing (Bock & Kim, 2002, Bock et al., 2005; Ryu, Ho, & Han, 2003, Lin 2007).

### **6.Theory of planned behavior:**

Theory of planned behavior (Ajzen, 1991) is one of the most prominent theories explaining human actions. It was developed by Ajzen to complement the Theory of Reasoned Action, another significant theory in explaining human behavior whose principles we had already described. According to the Theory of Planned Behavior, human behavior is driven by various beliefs towards an object or a behavior. Normative beliefs, referring to expectations of other people, behavioral beliefs, reflecting the attributes and consequences of a behavior and resulting in positive or negative attitude toward the behavior and control beliefs, including factors which may prevent the behavior from occurring conceptualized with a perceived behavioral control; are the three basic components of the theory of planned behavior (Ajzen, 1975, 1991). Person's attitude towards a specific behavior and a subjective norm form an intention to engage in a certain behavior. Intentions are usually carried out providing that the behavior is under the volitional control of the subject. However, the sheer intention does not always result in a behavior.

The construct of perceived behavioral control was introduced to predict the behaviors which are not under the volitional control of the subject but are affected by some other factors that may prevent the intention towards a behavior to lead to an actual action. Despite the fact that formation of intention to execute a certain behavior occurs as a result of attitude formation and the existence of subjective norm (Ajzen, 1977, 1991), still some outside factor might prevent the subject from performing a behavior. For instance, in virtual teams the difficulty of information technology use might result in team members' unwillingness to share their knowledge. For that reason, a concept of perceived behavioral control is introduced to better explain the process that leads to an engagement in a specific behavior. In other words, perceived behavioral control addresses the issue of external factors hindering behavior and the perceived ease of performing a behavior.

Perceived behavioral control can predict behavior and pose as substitute for actual control as long as people's perception of a behavior's difficulty is realistic (Ajzen, 1991). Additionally, when perceived behavior control is not particularly objective, it still influences the formation of intention toward a behavior. The perception of having control over a certain behavior will positively affect person's intention to perform a behavior, and will lead to exerting more effort and persistence (Ajzen, 1991).

The theory of Planned behavior has been validated by many studies, summarized and analyzed in various literature reviews (Armitage & Conner, 1999b, Sutton, 1998, Ajzen). In a study of Information system technology theory of planned behavior has demonstrated its predictive power of intention of users to use IS (Mathieson, Kieran, 1991), as well as in the

context in the eating healthy (Conner, Mark, 2002). In the next chapter in the attempt to design a conceptual model, the constructs of attitudes, subjective norm and perceived behavioral control are described in more detail, as is their role in explaining knowledge sharing behavior.

### **7.Personality traits:**

Personality has received much attention from the research community in many contexts. In recent decades research on personality traits and its exploration in the context of work behavior has been revitalized (Funder, 2001), especially in the domain of personality traits of leaders and followers. A recent meta-analysis of the trait-leadership relationship found leadership to be positively correlated with extraversion, openness, conscientiousness, and negatively related to neuroticism (Judge, Bono, Ilies, & Gerhardt, 2002).

Personality trait is relatively stable and enduring individual tendency of reacting emotionally or engaging in a behavior in a certain way (Tosi & Mero, 2003). Personality as a determinant of human behavior has been questioned considerably, often not yielding significant relationship due to poor conceptualization and the lack of standardization of personality traits. However, recent advancements in the theories of personality provide genetic and neurological insights into personality, which help, explain the origins and the content of apparent individual dissimilarities between people (Bouchard & Loehlin, 2001; Zuckerman, 2005). Therefore, a foundation for a common framework of personality traits has been built, leading to the creation of the “Big Five” theory research, and giving a research on personality a huge boost.

Five most salient (Goldberg, 1990) dimensions of personality belonging to the Big Five, that are considered hereditary ,stable over time and across cultures (McCrae & Costa, 1997) are: extraversion, neuroticism, openness to experience, conscientiousness and agreeableness (Costa & McCrae, 1991). Extraverted people are usually outgoing, sociable, assertive and energetic. Agreeableness is a disposition to be caring, good-natured and cooperative. Neurotic individuals tend to experience insecurity, anxiety and are not emotionally stable. Conscientiousness is the tendency to be tenacious, responsible, reliable, and orderly. Finally, people who are open to experience are likely to be independent, nonconforming, unconventional and have a strong imagination.

In many studies “big-five” personality traits demonstrated influence in general aspects of living such as longevity (Friedman et al., 1995) and cultural intelligence (Ang, Van Dyne, & Koh, 2006), Furthermore personality was found to be a significant factor in the context of job satisfaction (Judge, Bono, & Locke, 2000), job performance, (G. Anderson & Viswesvaran, 1998; work attitudes (Judge, Heller, & Mount, 2002), and behavior (Barrick & Mount, 1991). At the same time, many researchers have argued that mere existence of five personality traits is not sufficient for explaining behavior.

Despite the fact that some personality traits of the big five have exhibited a stronger relationship to behavior than the others, in order to achieve “an adequate understanding of personality, it is necessary to think and measure more specifically than at this global level if behaviors and their mediating variables are to be sufficiently, incisively represented” (Block, 1995). Therefore, each of these major personality traits’ context-specific facets, which are

more related to the actual observable behavior (Paunonen, Haddock, Forsterling, & Keinonen, 2003), should be taken into consideration when examining effects on behavior.

In the context of knowledge sharing, personality has been studied in relation to the performance and orientation goals, clearly exhibiting their mediating effect on knowledge sharing (Matzler & Mueller, 2011). Extraversion, conscientiousness and emotional stability were examined demonstrating that in a safe and supportive work environment, with low competitiveness, introverted, reliable and hard-working individuals share tacit knowledge (Borges, 2012). In contrast, extraversion was found to have a negative relationship and emotional stability was not significant.

Furthermore, in an empirical study conducted within an engineering company agreeableness, conscientiousness and openness exhibited positive relationship with knowledge sharing (Matzler et al., 2008; Mooradian, Renzl, & Matzler, 2006).

Additionally, a number studies examined the link between personality traits and various attitudes, confirming the relationship between two constructs (Francis & Leslie J., 1996, MacNicol, Murray & Austin, 2003). In one study the effects of group communication styles derived from personality traits on knowledge-sharing behaviors were mediated by knowledge-sharing attitudes of willingness and eagerness (de Vries et al., 2006). Willingness to share knowledge was positively impacted by team members' performance beliefs, job satisfaction, agreeableness and extraversion. Additionally, extroverted team members', which had a strong belief in their performance and were satisfied with their job, possessed an attitude of eagerness to share knowledge (de Vries et al., 2006).

In summary, only in a couple studies big five personality traits and several facets had been explored studies in the context of knowledge sharing. A gap between personality and knowledge sharing exists. The constructs of the Theory of planned behavior can be used to explain this relationship, as interaction mechanisms between personality and knowledge sharing behavior is not yet clear.

### **8. CONCLUSION**

knowledge sharing has been analyzed using relevant psychology and sociology theories. All theories have proven successful in explaining individual level knowledge sharing behavior in past studies. Despite the fact that the importance of knowledge sharing factors has been recognized in the existing literature, still inter-factor relationships and interaction was not identified and analyzed, a limitation which our study addressed by building a superior knowledge sharing framework.

None of the studies took a holistic approach in examining factors influencing knowledge sharing and the existing relationship between them. Although there were some attempts to determine critical success factors of knowledge sharing (Al-Alawi et al., 2007), they failed to include some significant factors and have not addressed the question of how factors from different contexts interact together to lead to knowledge sharing.

Existing literature suggests the strong need to empirically test and synthesize theories from different disciplines to examine the complex phenomenon of knowledge sharing in order to contribute to understanding people's knowledge sharing patterns and causes. For that

reason, the study is grounded on existing social, psychology and organizational theories, which are applied to analyze knowledge sharing on the individual level. By integrating several theories and applying them to knowledge sharing context in an interactive form a model of critical success factors for sharing tacit and explicit knowledge is built while taking a holistic approach in explaining the knowledge sharing behavior.

Furthermore, as the literature review suggests a gap in personality and knowledge sharing literature exists, with both direct and indirect relationships through other intrinsic variables not being sufficiently explained. Another drawback of the existing studies is that most of them do not distinguish between different attitudes toward knowledge sharing.

Additionally, even though team performance as an outcome of knowledge sharing has to some extent been investigated in the prior literature (Cohen & Bailey 1997; Cummings, 2004; Rico et al., 2008, Greenhalgh & Chapman, 1998; Schittekatte & Van Hiel, 1996) demonstrating its value in the context of innovation, competitive advantage, quality etc., it has not been studied in the context of scientific cooperation, and not as an outcome of sharing of explicit and tacit knowledge. Therefore, the division of tacit and explicit knowledge sharing is mandatory, as they are quite different in nature. Also they are under the influence of differing factors and might not contribute to the team performance to the same extent.

Another limitation of existing studies is a possibility of a common method bias occurring because in a number of studies a questionnaire completed by a single source at one time period to measure all constructs was used. At the same time only a handful of studies have examined knowledge sharing in organizations and on projects characterized by a dynamic labor environment suggesting that knowledge sharing in such atmosphere is influenced by factors differently from those in more traditional working environments (Chalkiti, 2012). Influence of factors on knowledge sharing differs on how effectively geographic dispersion, IT utilization, team diversity and task coordination are managed, and how different cultures deal with facets of “virtuality” (Duranti & Almeida, 2012; Zakaria & Talib, 2011).

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