CHAPTER -I: INTRODUCTION

1.1. Background of the Study

The importance of agriculture to the world can be observed in the history of human evolution. We can divide the evolution of human race in different stages starts from hunters, nomads, agrarian age, industrial age and till present information technological age. Among this the greatest change to the human evolution observed in agrarian age. As it linked with one of the basic need of human beings it has its own significance forever. Over the years agriculture has witnessed many changes ranging from patterns, products and procedures. The growth of other sectors also fostering the growth of agriculture sector all over the globe. In India, agriculture is considered as very important for its self-sustainability for food to feed its mammoth population. More than sixty percent of countries’ workforce depends on agriculture and its allied services. India has one of the largest and oldest agricultural system in the world. The practice of agriculture is observed in Indus valley civilization, Vedic literature and in some southern history (Stein & Burton, 1998). The significant impact of agriculture in India is observed in its socio-cultural-economic fabric. Human settlements, family systems, social structures, cultures, festivals, business etc are established based on agriculture.

The major breakthrough in the Indian agricultural system is importing the high yield variety seeds during 1960s. India learned from the green revolution in Mexico by Norman Borlong- who is considered as “The Father of Green Revolution” by introducing semi-dwarf high yield varieties of wheat during famine in Mexico. Later the green revolution was spread to India and Pakistan. In India with the initiation of Dr. M. S. Swaminathan, known as “The Father of Indian Green Revolution” who mixed the Mexican HYV seeds with Indian wheat and succeeded in bringing high production in famine time and country has emerged from food deficit to self-sufficient in food grains. Green revolution in India is successful in northern parts of India because of rich source of water and climatic conditions. The impact is comparatively low in southern part of nation. From that movement the scientific revolution in agricultural field is increased. At present India is the world’s largest producer of many agricultural products and its playing an important role in country’s’ economy.

The agricultural sector in India creates great employment opportunities by accommodating 48.9% of workforce and nearly 70% of the population depends on agriculture and its allied sectors. The contribution of agriculture in countries GDP was 57% in 1950-51 to
17.4% in 2015-16 shows decline in percentage terms but significant single large contribution to GDP. After independence Indian government has taken steps to improve innovative research. Strengthening the institutional setup for agricultural research to improve the quality and effectiveness of agricultural knowledge and science & technology. The government was unable to implement various programs and schemes which resulted the stagnation in production, poor infrastructure for storage, food security issues.

The economic survey of India (2015-16) has observed that “Indian agriculture is in way, a victim of its own successful Green Revolution”. The reflecting dark realities of Indian agricultural sector at present has been inflicted by Green Revolution. The introduction of high yield varieties and fertilizers has brought increased productivity but in the long run we observed negative environmental factors. The present stagnant growth of agricultural production is because of lack of new technologies and breakthrough innovations. Indian agricultural research system has played a significant role in fostering green revolution but there hasn’t been any breakthrough research in recent past. Along with environmental factors there are other institutional factors ranging from lack of financial support, rising costs, lack of infrastructure, lack of strong supportive education system, poor diffusion of new and innovative technologies and practices, lack of linkages between the research institutions and so on.

Innovations are considered as the major driving forces in any field of work. Even in agriculture sector innovations are required for a sustainable agricultural growth. Introduction of new varieties and new process are becoming necessary in the changing world. This study will help in finding the factors influencing the innovation in agricultural institution. The study enables us to understand the intangible and cost-effective factors of innovation. The implicated results can be used to strengthen the policies in agricultural research institutions under Indian Council of Agricultural Research (ICAR).

1.2. Indian Agricultural System at a Glance:

Indian Council of Agricultural Research (ICAR) is the nation’s apex institution for coordinating, guiding and managing education and research activities in agriculture, fisheries and animal science field in entire nation. Indian Council of Agricultural Research is an autonomous organization and works under the Department of Agricultural Research and Education, Ministry of Agriculture and Farmers Welfare- Indian Council of Agricultural Research was established in 1929 with its headquarters at New Delhi. ICAR is the one of the
largest national agricultural system in the world with its vast network of institutions across the country. It has 101 institutions and 71 agricultural universities all over India.

The ICAR is instrumental in creating a platform in bringing private sector, non-governmental sector and foreign institutions to collaborate for creating and disseminating new technologies and innovations to existing agricultural system. The initiatives for networking the research institutions ICAR has introduced the knowledge management system. Knowledge is being considered as an important intangible resource with a greater potential to bring innovation. The organizations have to identify the existing knowledge (both tacit and explicit) and transfer among the people, systems, process and products in the organization. This knowledge management system helps in identifying, diffusing and usage of knowledge in order to create new knowledge. Since knowledge is internally linked with human minds and their action, sharing is very difficult in its raw form. Nonaka (1995) socialization process helps in understanding sharing of tacit and explicit knowledges. Knowledge sharing is affected by many behavioral, social, psychological and organisational aspects. From the literature this study identified social capital and organisational culture as knowledge sharing promoters.

The future of Indian agricultural research depends on its research and development, technological integration, scientific approach to agriculture, connecting rural farmers with modern technologies, Innovate and providing the policy interventions by the government in terms of subsidies, crop insurance and minimum support price (MSP). Therefore, this research helps in understanding the need for innovation and finds the theoretical and empirical support in finding the variables influencing innovation. This chapter further explains each selected variable and their relationships in detail with literary support.
1.3. Significance of Innovation:

In Barnett (1953) words Innovation is “introduction of something new and never before”. There are many definitions given by scholars from different fields. The study observed few definitions in terms of exploitation of existing knowledge. Thompson (1965) defined innovation as “the generation, acceptance and implementation of new ideas, process, products and services”. Successfully application of new ideas brings innovations (Rhee et.al, 2010). West and Farr (1990) defined it as “an internal introduction and application of new products, process, procedures or ideas that are significantly designed to benefit the individuals, groups, organizations or society at large”. In a concise way Anderson et.al. (2004) also explained the innovation as “intentional introduction and application of new and improved way of things”. Amabile et al (1996) has given simple definition of innovation as “the successful implementation of creative ideas within the organizations”. From the definition of Kimberley & Evanisko (1981) we draw inputs for this research by considering the product and process innovations. They observed that innovation happens in three different ways: as process, as products and services, finally as innovative organization.
Literature provides many distinct strategies for achieving innovation. The familiar strategy is exploration of new opportunities and exploitation of the existing resource (March, 1991; Tushman and O’Reilly, 1996, and Schulz et al., 2008). The knowledge management strategy is another important strategy in innovative literature, works of Nonaka & Takeuchi (1995), Cohen & Levinthal (1990), Dougherty et al. (2002) and Smith et al. (2005) empirically supports the relationship between knowledge management and innovation. They argued that innovation in organizations relies on knowledge accumulation, effective knowledge transfer within the systems and extensive use of existing knowledge. It helps the organizations in getting creative solutions to the raising problems and changing needs. the knowledge sharing effect is better understood when it tested with two dimensions of innovation (exploitative and explorative). Knowledge is being consider as most important resource in bringing the organizational outcomes like product and process innovations (Kogut and Zander, 1996; Smith et al., 2005). Product innovation is generally defined as “introduction of new products or change in design of existing products or using new materials in production of established products”. Process innovation is “implementation of a new or significantly improved production or delivery method”. Before knowing the relationship between knowledge sharing and innovation, a brief literary support is given for knowledge and its importance on innovation.

1.4 Knowledge and its Significance in the Contemporary World:

“Knowledge” is the most reverberating word in the present technologically advanced world. Centuries of debate on the concept of knowledge has given an understanding about the continuous changing forms of knowledge and its availability and application. To start with the great Greek Philosopher Plato’s definition of knowledge as “it occurs when the true belief is accompanied by rationale account”. Now we can see knowledge from this understanding to the present emergence of knowledge as a powerful management resource along with tradition resources like men, machine, money and materials is the significant landmark in the new information era. Perhaps Davis and Botkin (1994) is the first to recognize knowledge as key resource in the organizations to bring higher levels of performance. Knowledge is also recognized as key economic resource by some scholars (Ruggles, 1998; Zack, 1999 and Earl, 2001).

Nonaka and Takeuchi (1995) defined knowledge as “the very flow of information and information is the flow of messages”, which has capacity to act (Sveiby, 1997). Boisot
(1998) defined “knowledge which builds on information that extracted from raw data”. Davenport and Prusak (1998) defined knowledge as “fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information”. They argued that knowledge usually exists in individual mind and its application is also within the mind of individual. According to Davenport and Prusak (1998) the knowledge in the organizations is embedded in documents and repositories and it is also gets embedded in organisational routines, processes, practices and norms”. Gammelgaard and Ritter (2000) mentioned knowledge as “the combination of experience, values, contextual information and expert insight that help evaluate and incorporate new experience and information.

Knowledge is considered as the central resource for the production in the new information age. Nanda (1996), Spender (1996) and Boisot (1998) noted that organisational knowledge produces key strategic resources for organizations sustainable competitive advantage (Davenport and Prusak, 1998; Grant, 1996; Foss and Pedersen, 2002) without which it is very difficult to make use of other resources in the organizations. The unique nature of knowledge is its intangible nature, hard to imitate, ambiguous and path dependent. Wernerfelt (1984) and Barney (1991) mentioned that firms competitive advantage lies in the combination of tangible and intangible assets at all the levels. All these unique characteristics makes knowledge as a strategic source of competitive advantage in the long run. Sharing of this knowledge is one of the key process in the organizations to leverage the collective knowledge (Nahapiet and Ghoshal, 1998; Wasko and Faraj 2000). Organizations must focus on the flow of knowledge and expertise from people to people (Hinds et.al,2001). Damodaran and Olphert (2000) also argued for effective exploitation of knowledge base in the organizations.

The most basic discussion within the knowledge literature concerns with distinction between three aspects of knowledge, which are Data, Information and Knowledge. Sometimes it extends to wisdom (Gurteen, 1988). Nonaka and Takeuchi (1995) Boisot (1998) categorized these elements in same category. The existing distinctions explains that knowledge is more than data and information. In fact, knowledge relies on information which relies upon data (Drucker, 1988; Davis and Botkin, 1994, Zack, 1999; and Grover & Davenport, 1988). Nonaka and Takeuchi (1995) defined the relationship as knowledge is created by the very flow of information and information is the flow of messages. Boisot (1998) defined the relationship by saying “knowledge builds on information that extracted from the data”. Leonard and Sensiper
(2002) defined “knowledge as a subset of information”. Data which includes raw facts and figures, Information is synthesis of the raw data and knowledge is combination of data and information through personal contribution of the individual.

Data and Information can be separated from the individuals but not the knowledge. It can only be transferred to other peoples, systems and into organizations. This study has focused on sharing of knowledge in its two forms one is explicit knowledge and another is tacit knowledge. Nonaka (1994) divided knowledge into explicit and tacit forms, Backlund (2012) described three dimensions of knowledge, which are formal knowledge, practical and familiarity knowledge. Davenport and Prusak (1998) described knowledge should be explicit in different ways to separate from the individuals. The idea of explicit and implicit was traced back to the Polanyi (1966) stating the difficulty of expressing tacit knowledge. Rumizen (2002) and Zack (1999) defined tacit knowledge as subconsciously understood and applied, and usually shared through highly interactive conversations, storytelling and shared experience. It also includes know-how, insights, experience and rules. In contrast to this, explicit knowledge is more precisely articulated, it includes codified data, storage capacity, easy of sharing and expressing. Davenport and Prusak (1998) and Demarest (1997) pointed that explicit knowledge can be identified and expressed in products and services, management practices and process, and in its organizational culture. Later section of this chapter represents the literary empirical evidence of tacit and explicit knowledge sharing.

1.4.1. Knowledge Sharing:
The concept of knowledge sharing has been elaborated in the literature of knowledge management, information systems, innovative systems, technological transfers, intellectual capital, organisational cultures, behaviors, learning and performances and in the strategic management areas. Nelson and Rosenberg (1993) mentioned knowledge sharing has become extended leaning process rather than simple communication process in development and innovation. There is no unanimous definition for the knowledge sharing. Connelly and Kelloway (2003) defined knowledge sharing as the means in which knowledge may be shared between individuals, groups and organizations. Bartol and Srivastava (2002) defined it as “The action in which employees diffuse relevant information to others across the organization”. Helmstadter (2003) defined knowledge sharing as “Knowledge sharing is voluntary interactions between human actors [through] a framework of shared institutions, including law, ethical norms, behavioral regularities, customs, and so on”. Hogel et al.(2003) define KS as a social interaction culture, involving the exchange of employee knowledge, experiences, and skills through the whole department or organization.” Knowledge sharing at inter-organisational level is documented in the works of Luna-Reyes and Garcia (2008), Mu et.al (2008), Willem and Buelens (2007), and Pardo et.al (2006). Knowledge sharing is the fundamental way, in which employees can contribute knowledge application and in creation of new knowledge.

Knowledge sharing is a voluntary act (Davenport, 1997) and reciprocal process (Willem, 2002) occurs between at least two parties. In this interplay of two parties, one is called “source” and other is “recipient” (Van den Hooff and de Ridder, 2004; Norman, 2007; Zhang and Jiang, 2015). Lin (2007) observed knowledge sharing as a process of social interaction in the organizations, where they will exchange skills, experience and expertise. It enables individuals in the workgroups to enhance their competencies and creates new knowledge (Sveiby, 2001). Bollinger and Smith (2001) highlighted the role of human behavior in knowledge management related studies. The Knowledge sharing at individual level is mostly tacit in nature, in this people can learn from others experience and they can develop new ideas (Reid, 2003 and Cummings, 2003). The behavioral aspects of knowledge sharing are an exploring area in research and development institutions. There is a need for studies in inter-organizational knowledge sharing in collaborative research activities.

Knowledge sharing as a process have to integrating factors, one is knowledge collecting and the other one in knowledge donating. Van den Hooff and Van Weenen (2004) also
identified these two-dimension of knowledge sharing process. Knowledge collecting is known by its process of consulting and encouraging others to share their knowledge and Knowledge donating is the process of sharing/communicating individual’s knowledge with others. These two collecting and donating behaviors are empirically studied in many works. Very important SECI Model described by Nonaka (1995) explains the explicit and tacit forms of knowledges. Many studies empirically test these two knowledges with different organizational aspects.

1.4.2. Tacit Knowledge Sharing:

Tacit knowledge is the accumulated knowledge by individuals while performing different tasks and duties in different situations of their life. It reflects the knowledge based on experience and expertise of individuals. According to Polanyi (1962, 1966), Spender (1996), Nonaka (2002) tacit knowledge is personal and embodied in the individual. As it famously explained by Polanyi (1966) “we can know more than what we can tell”. Because of personalization nature of tacit knowledge, it is very difficult to codify and disseminate (Nonaka, 2002) It involves both cognitive and technical elements. These cognitive elements are developed by the understanding of different domains. To list some cognitive elements are beliefs, views, analogies, paradigms and schemata. The technical elements consist of know-how (Ryle, 1949) subsidiary awareness (Polanyi, 1966) and actionable skills required in particular contexts (Brown and Duguid, 1998). This tacit knowledge acquired through continuous process of unconscious trial and errors (Polanyi, 1962) and Choo (2000) describes as the continuous doing of task over the period gives judgements for successful execution of tasks.

1.4.3. Explicit Knowledge Sharing:

Nonaka (1994) defined explicit knowledge sharing as “systematic language which can be transfer”. The information is codified and as a consequence it can be easily understood, transferred and stored by others. Mostly it is in the form of data or information, manuals, technical, patents, copyrights and in manuals. It has the potential to explain why things work. The explicit knowledge is readily available “know-what” and easily transferable between people. Individuals need to have basic education for utilizing the explicit knowledge. The explicit knowledge and technology are interlinked in this technologically advance world. Knowledge can be stored in different form either in documents form, digital form or images and this knowledge can be stored and shared through these systems. The explicit knowledge is
not sticky in nature so many organizations finding ways to convert its tacit knowledge into explicit form for the use of other members in the organizations. Hansen et al (1999) the availability of codified knowledge in the organizations helps them in saving their efforts, cost and valuable time.

1.4.4. Knowledge Sharing Enablers:

After knowing the importance of the knowledge in the organizational success, research has increased to find the knowledge sharing enablers. Lin (2007) identified some mechanisms that facilitate knowledge sharing within the organizations and called them as knowledge sharing enablers. Which intern enhances the learning capacity of individuals and organizations. Calantone et al. (2002) and Syed-Ikhsan & Rowland (2004) focused on the relationship between innovative performance and knowledge sharing enablers. There are many factors which influence the individuals or teams to share their knowledge or to hinder knowledge sharing intentions and behaviors. The factors like motivational, technological, socio-psychological, organizational cultures/ structures are believed to be influencing the knowledge sharing behaviors of the individuals.

The individual factor includes experience, beliefs, values and motivations. Polanyi (1958) and Kogut (1992) finds individual knowledge is difficult to share without social exchange. Theory of Reasoned Action (Fishbein and Ajzen, 1975) stress the role of social exchange process and human behaviors in enabling the knowledge sharing. The individual knowledge sharing activity depends on their experience, enjoyment in helping others, motivation, beliefs, self-efficacy and trust (Bock and Kim, 2002; Cabrera et al., 2006; Lin, 2007; Aulawi et al., 2009). The willingness to share knowledge depends on the perceived value of the knowledge by the concerned individual. When the individual is confident about drawing significant organisational outcomes with the shared knowledge, they will discharge tacit knowledge more effectively. If we integrate the self-determination theory (Deci and Ryan, 1985) into theory of reasoned actions, it can be drawn that people who perform work for pleasure are more tend to gain from it and are usually shares knowledge. As mentioned by Yoo and Torrey (2002) knowledge sharing behavior is influenced by contextual and individual motivations. These motivations are of two types one is extrinsic motivations and second one is intrinsic motivations. Extrinsic motivations include rewards (Granovetter, 1985; Constant et.al, 1994, Huber, 2001). The role of trust in knowledge sharing is documented in vast knowledge management literature. Davenport and Prusak (1998); Soliman and Spooner (2000); Adler
At the organisational level knowledge sharing can be promoted by organizational culture (Saleh and Wang, 1993) norms, beliefs, climate, structures, leadership (Taylor and Wright, 2004) and top management support (Mac Neil, 2004). All these factors create a sense of belongingness to the individuals in the organizations. This brings the commitment towards organizations to share knowledge with other employees. The confidentiality, trust, honesty and sincere attitude plays significant role in public sector organizations.

Technological level the knowledge sharing is fostered by ICT, it is playing a critical role in disseminating, sharing, using the existing organisational knowledge. Organizations with strong technological support is successful in sharing the knowledge to its peoples, process, products and systems. There are many empirical works showing the role of technology in fostering the relationship between knowledge sharing and innovation. This research study is concern about two factors in promoting knowledge sharing. They are organisational culture and social capital. next few sections elaborate the selected variables with respect to output variable.

1.4.5. Knowledge Sharing Outcomes:

Literature provides support that knowledge sharing is positively related to firm’s innovation capacity, development of new products and services, team performance, project success, reduction of expenses and many other potential benefits. (Hansen, 2002; Cummings 2004; Arthur and Huntley, 2005). In this competitive world knowledge sharing plays an important role in creating opportunities and in generating solutions for the rising competitions (Reid, 2003). Knowledge sharing is identified as essential element for enhancing the learning capacity and innovative performance (Calantone et al, 2002 and Scarbrough, 2003). Knowledge sharing helps in mastering the new product designs, process and organizational designs (Nelson, 1993). Organisational learning is as outcome in organization by sharing the knowledge effectively (Woerkom & Sanders, 2010). Knowledge sharing will lead to faster responses at lower cost (Sher & Lee, 2004) and brings changes in the organizations according to market change (Vaccaro et al, 2010).

1.5. Knowledge Sharing effects on Innovation:
Knowledge is being considered as the most important resource in bringing organizational outcomes like product and process innovations (Kogut and Zander, 1996; Smith et al., 2005). The close link between innovation and knowledge is observed in the seminal works of Nonaka and Takeuchi (1995). The social complexity and path-dependence characteristics made knowledge sharing an important input for innovation (Dimitris et al., 2007; Chiang and Hung, 2010; and Von Krogh & Hefliger, 2010). The increased empirical evidence on the role of knowledge in innovation process and innovation management was observed in studies of Darroch & McNaughton (2002) described knowledge sharing as an instrument in bringing the new process, disciplines and cultures. Nonaka and Takeuchi (1995), Smith et al., (2005), Dougherty et al. (2002), Hargadon and Sutton (1997) and Cohen & Levinthal (1990) these studies identified the role of new and diversified knowledge in producing creative solutions, problem solving ability and creating potential new products and services. These studies also stress the need for successful transfer of knowledge between people, groups and in the organisational process and products for organizational innovation.

The concept of knowledge sharing with its unique and ambiguous natures has shown greater impact on innovation in organizations. Knowledge is highly considered as a simulative agent for achieving persistent innovation (Ipe, 2003; Wasko and Faraj, 2005). The organizations innovation reflects in its capacity to embedded the new knowledge (Subramaniam & Youndt, 2005) and ability to use the knowledge according to the changing market needs, solutions for rising problems and creating new products (Goh, 2002; Tidd et al, 2005 and Marina du, 2007). Lundvall and Nielsen (2007) and Michael & Nawaz (2008) identified firms with greater scope to promote knowledge sharing practices likely to create new ideas and facilitate innovation.

For greater understanding of the relationship some researchers considered tacit and explicit knowledge sharing effect on innovation, which are considered fundamental forms of knowledge sharing. This is emphasized in the works of Lingyan Hu and Amy E. Randel (2014) and Mahmood Zohoori et al (2013) finds a positive significant relationship on explicit knowledge sharing and tacit knowledge sharing with innovation speed and quality of innovation. Zhining Wang and Nianxin Wang (2012) finds the positive relationship between innovation and knowledge sharing. The readily shared codified knowledge is positively affecting the speed and quality of the innovation but the tacit knowledge is affecting only quality of the innovation. It indicated the need for faster knowledge sharing systems for the
faster innovations is identified. Dissemination of tacit knowledge into the system is necessary to improve the quality of the innovation. The need for knowledge management practices like CoP (Communities of Practice) storytelling, roleplay etc. to be encouraged in the institutions.

Although there are many empirical works (Hall & Andriani, 2002, 2003; Liu et al, 2005; Leiponen, 2006; Brockman & Morgan, 2006; Lee et.al, 2010) establishing the relationships between knowledge sharing and different facets of innovation. Very few studies focus their research on specific effects of explicit and tacit knowledge sharing on product and process innovations respectively. This study tries to establish the relationship empirically in Indian context.

1.6. Knowledge Sharing Approach of Social Capital:

This part of the chapter helps in understanding the social factors governing the exchange of knowledge among the people in the organization. It consolidates the supporting evidences from different disciplines that engage in socio-psychological behaviors. The existing empirical findings show the relationship between knowledge sharing and other social factors. This section helps in understanding the concept of social capital and further steps taken to constructively establish relationship between knowledge sharing and different dimensions of social capital.

1.6.1. An Overview of Social Capital

The social capital concept has its roots in Bourdieu (1983) work “the sociology of education”. In this the social capital is observed in the sociological perspective. Later it was popularized across all social science departments by different social scientists. The concept was adopted and spread into other disciplines by Coleman (1988, 1990), Burt (1992, 1997), (Putnam 1995) and Fukuyama (1995). Managerial perspective of social capital was highlighted by Nahapet & Ghoshal (1998), Tsai & Ghoshal (1998), Leana & Van Buren (1999), and Adler & kwon (2002). All these works reflect the applicability and adoptability of the social capital concept in different fields.

The increased popularity draws attention to the concept of social capital in social sciences resulted in several definitions. Starts with the French sociologist Pierre Bourdieu (1977, 1980, 1983) defined the concept as “the resources, support or services gained by simply being a part of group or extended network by virtue of one’s network position”. Another
important American sociologist James Coleman (1988) defined the concept in relation to the human capital production. He defined social capital as “resources accumulated through the relationships among people” and he further explained that social capital involve reciprocity and no one can control the jointly owned resource. The strong cohesive social ties create an environment which facilitates trust and cooperative relationships. Putnam (1993, 1995, 2000) gave the definition for social capital as “networks, norms and trust, that enables individuals to act together more effectively to pursue shared objectives”. Adler and kwon (2002) defined SC as goodwill that is engendered by the fabric of social relations and that can be mobilized to facilitate action. Nahapiet and Ghoshal (1998) defined SC as “The sum of the actual and potential resources embedded within, available through and derived from the network of relationships possessed by an individual or social unit”.

By consolidating all these operational definitions, we can define social capital in simple words as “the intangible asset of an organization, that exists in the network of relationships between and among the actors and collective units”. In fact, social capital is nowadays widely perceived as a necessary precondition of effective organizational behaviour. Lesser (2000) argues, ‘that social capital acts as the fluid that enables the knowledge-intensive organization” Social capital has been related to such prominent drivers of competitive advantage as organizational knowledge (Lesser, 2000; Cohen & Prusak, 2001) intellectual capital (Nahapiet & Ghoshal, 1998; McElroy, 2002) communities of practice (Lesser & Prusak, 1999) effective inter-organizational collaboration (Walker et al., 1997; Yli-Renko et al., 2002) and development of virtual communities (Blanchard & Horan, 1998). The growing importance of knowledge and need for strong social relations in network organizations brings attention to this research. Another factor influencing the current interest in the topic is the emerging understanding that knowledge processes which are essentially social by nature. For example, knowledge is typically created, enriched, shared and leveraged in social interaction among several people. Most discussion and decision making occurs in groups, and the social context influences motivation and action of individual organizational members to a significant degree (e.g. Amabile, 1988; Kogut & Zander, 1992; Nonaka & Takeuchi, 1995; Nemeth, 1997). Social capital dimensions were mentioned below, before analyzing the relationship between knowledge sharing and social capital dimensions.

1.6.2. Dimensions of Social Capital:
Putnam (1995) argued the need for classifying the social capital into different dimensions as a high priority due to its multidisciplinary nature and multi-facets. Nahapiet and Ghoshal (1998) suggest that social capital has three distinct dimensions: structural, relational and cognitive. They clarified the dimensions of social capital in the context of business firms, three interrelated, overlapping but different dimensions. Woolcock (2001), Aldridge, Halpern and Fitzpatrick (2002), Newell, Tansley and Huang (2004) identified Bonding, Bridging and Linking as three social capital dimensions. Lesser (2000) differentiates three primary dimensions of social capital, namely structure of relationships, interpersonal dynamics and common context and language. This research base the Nahapiet & Ghoshal (1998) definition and dimensions of social capital (Structural, Relational and Cognitive Dimensions). The following section describes each component of social capital separately in detail.

1.6.3. Structural Dimension of Social Capital:

Social capital resides in social networks, that is clusters of relationships between people. Social networks studies have been increased in social sciences (Scott, 1991). The structural dimension of social capital encompasses the relational network of the system under investigation, that is the actors and the configuration of links among them. It includes the structural relations within the organization and provides network process for optimal utilization of social capital existing in these networks. Scott (1991) and Wasserman & Faust (1994) are interested in finding the pattern of linkages, density and connectivity of the network and frequency of interaction actor. The classical work of Granovetter (1973, 1985) demonstrated the strong and weak ties in producing different types of benefits. Strong ties tend to increase trust and diminish opportunism among actors and serve the satisfaction of expressive needs. Weak ties, on the other hand, produce information benefits, as most new knowledge is likely to come from actors who represent different social groupings from the actor’s own immediate community. The two types of social connections and their associated pros and cons can be related to two opposite views on how network structures create social capital. On the one hand, social capital can be seen as arising from the similarity, safety and predictability provided by a closely-knit community where all the members are linked by strong ties. This view is connected with the socio-centric. On the other hand, weak ties and structural holes provide individual actors with a wider array of information (Burt, 1992; Hansen, 1999) and flexibility (Gargiulo & Benassi, 2000) and thus produce relative advantage to these actors. In general, the structural dimension of social capital depends on its actors. Choo (1988) defined these network
relationships in terms of actors, activities, resources and time. The strength of structural capital depends on the individuals and their activities in the organizations, the capability of networks depends on the knowledge flow and its actors to share.

**1.6.4. Relational Dimension of Social Capital:**

In the backdrop of social capital theory, the study believes social capital as network of relationships and resources embodied in social networks. The relational strengths depend on developed personal relationships of the people through history of interactions. Since the behavior of individual depends on their social networks. Relational dimension of social capital comprises of trust, reciprocity, collaboration and team orientation that are developed between specific people. Tsai (2002) examined the influence of relational structures on knowledge sharing. Trust is considered as most studied and primary relational aspect of relational social capital (Coleman, 1990). There are lot of literature (Fukuyama, 1995; Levin and Cross, 2003; Chowdhury, 2005) considers trust as important relational capital. Rousseau et.al (1998) defined trust as “a psychological contract with an intention to accept vulnerability based on the positive expectation of intentions or behavior of another”. This explains the relationships exists in networks, the ties and personal relationships among individuals in the group enhances the knowledge sharing capacity (Cross and Cummings, 2004; Chiu et all., 2006). After trust, identification is considered as important aspect in relational capital. The identity is concern with individuals view themselves with respect to others. System closure is another aspect in the relational capital, it provides effective sanctions to social capital. To understand the nature of knowledge sharing behavior or any other behaviors one has to mix the structural and relational dimension of social capitals.

**1.6.5. Cognitive Dimension of Social Capital:**

This is very important social capital dimensions helps the individuals, teams and organizations work collectively for common goals. It creates a plat form or pre-conditions for their collective actions. This social capital dimension comprising of shared norms, mental models, shared values, beliefs, attitudes, narratives, share languages, shared goals and share visions. Language as an important attribute helps individual to share their knowledge and narratives helps in better communication. It embodies importance of sharing information with shared meanings in the networks. All these attributes in this cognitive dimension gives a proper understanding about their collective goals and actions. Nahapiet & Ghoshal (1998) referred
cognitive dimension as the provider for systems which support shared manifestations (representations) and interpretations among parties. Boland and Tenkasi (1995) mentioned the common perspective of cognitive dimension of social capital enables individual to develop similar perception and interpretation. This dimension shows its direct impact on relationships between people. Moran (2005) and Burt (1992) pointed that stronger relationships is possible between partners in organizations through shared norms and shared values. Tsai & Ghoshal (1998) described cognitive social capital, that embodied in organizations shared visions and collective goals with common expectations and interpretations.

1.7. Knowledge Sharing and Social Capital:

Knowledge is essentially social by nature. The social interaction ties help the individuals to access the wider range of knowledge and further help in combining and exchanging knowledge among people or units. Eisenhardt and Tabrizi (1995) mentioned that knowledge sharing among group members stimulates mutual learning, which in turn encourages innovation. Brown and Duguid (2000) emphasis that share languages and values helps in encouraging explicit knowledge sharing as it is easy to communicate with shared foundations. Sharing explicit knowledge in forms of existing ideas helps in recombining for innovation (Kogut and Zander, 1992). Leonard and Sensiper (1998) stated that tacit knowledge sharing facilitates innovation when effectively shared with individuals which creates new ideas and products. At organisational level tacit knowledge sharing across the firms helps in increased innovation capacity of firm (Cavusgil et al, 2003). Greater innovation is possible when tacit knowledge is shared under high degree of social capital (Perez-Luno et al, 2011). Yan Yu et.al. (2013) distinguished that social capital plays different role in different knowledge sharing. Social capital at individual level is promoting the explicit and tacit knowledge but at team level the social capital only promoting individual tacit knowledge sharing and it also finds the influence of team density. Wing S. Chow and Lai Sheung Chan (2008) have taken each factor in three dimensions of social capital to check with knowledge sharing. social network in structural SC, social trust in relational SC and shared goals in cognitive SC with tacit and explicit knowledge sharing and finds both social network and shared goals shows indirect effect on knowledge sharing with in organizations. Direct effect was observed with social trust and knowledge sharing.

Nahapiet and Ghoshal (1998) finds strong interunit relationship influence of relational and cognitive dimensions on interunit knowledge sharing. The same was test by Wilhelm
Barner-Rasmussen (2003) and finds the same. In knowledge sharing context there are many social factors showing significant impact on knowledge sharing.

1.8. Organisational Culture:

Organizational culture is extremely broad and inclusive in scope. It comprises a complex, interrelated, comprehensive, and ambiguous set of factors (Quinn and Cameron, 1999). Organizational culture as a concept is considered to be a key element of managing organizational change and renewal (Pettigrew, 1990). Thus, culture is a sort of glue that bonds the social structure of an organization together. Organizational culture is a group of assumptions, values, beliefs and accepted faiths which have been commonly interpreted by the organization members and show the real values declared by the organization and its members (Asoka, 2007). Furnham and Gunter (1993) defined the organizational culture as “common beliefs, viewpoints and values existing in an organization; in simple word, the culture means the quality of our performing”. In other words the shared, basic assumptions that an organization has developed while coping with environment and solving everyday challenges that are taught to new members as the correct way to solve those problems (Park, Ribiere & Schulte, 2004).

The success of an organization is wholly depending on how effectively it can share its functions, goals and values to its employees and to its customers. Deshpande and Webster (1989) stated organizational culture as “the set of shared values that help organizational members understand organizational functioning and thus guide their thinking and behavior”. Culture is considered to be group-specific behavior that is acquired, at least in part, from social influences. Barney (1986) said that culture influences the organisational process and behaviors over the time with its complex system of norms and values.

It is necessary and important to understand the catalytic role of organizational culture in the change process of organizations. When organizations install new process, technologies, they expect knowledge to flow. Organizational culture is the key to success for any activity within and outside the organization and also for individuals working in the organization. Organizational culture provides a medium for interactions, where people can communicate (Johnson, 1993).

1.9. Knowledge Sharing Perspective of Organisational Culture:
Organisational Culture has been identified as one of the key components in organisational long term success (Thomas, 1985). It integrates the individual knowledge with organisational knowledge through knowledge sharing (Gupta, Iyer and Aronson, 2000). Nicholls (1985), Edwards (1988) and Robbins & Barnwell (1994) described organisational culture by its shared values, beliefs acquired by its employees within the firms. Culture is a social learning by majority of employees for a continuous period of time in the organizations, it provides norms, beliefs, values for the behaviors in the organizations.

The influence of organisational culture on knowledge sharing is observed in many research studies. To list the organisational cultural factors on individual knowledge sharing behaviour, Hall & Goody (2007) observed that organizational culture has significant impact on people’s information sharing attitude. Alavi and Leidner (2001) also mentioned that organisations display their knowledge sharing culture in its beliefs, values and attitudes. There are two aspects organizational need to impart in their culture. One is creating an environment for strong social norms and the second one is creating trustful and caring environment for encouraging individuals to share their knowledge with each other. De Long and Fahey (2000) identified establishment of knowledge sharing norms in organisations helps in crating, sharing and using of knowledge effectively in their work culture.

A supportive culture in organisations enhances the knowledge sharing behaviour of individuals within an organization. The support from top management acts as motivation to share their knowledge with others in the work place (Wang and Noe, 2010). To be innovative and readiness to change are the key influential characteristics of organization culture in promoting knowledge sharing behaviour. In addition to these, organisations can promote shared vision among its employees to promote knowledge sharing culture (Ladd & Ward, 2002). Moreover, the quality and quantity of knowledge base in a community depends on the knowledge sharing system where free flow of knowledge is possible among its employees (Hult et al., 2002; Raban & Rafaeli, 2007). Ulrich (1998) identified that knowledge sharing culture is positively associated with organisational culture that create challenging, motivational work environment. Davenport and Prusak (1998) indicates the need for common cultures and terms for effective knowledge sharing among units. The influence of sense of identification on knowledge sharing is observed in some organisational cultures. The same is empirically established in the works of Jarvenpaa & Staples (2001). There is an indirect effect of organisational culture on knowledge sharing is observed in Ruppel and Harrington (2001) by
encouraging intranet, which intern encourages knowledge circulation and dissemination in organisations. Research has shown that organizational culture emphasising trust and innovation is favourable to share knowledge. Cabrera & Cabrera (2005) identified fair decision-making and open communication is expected to promote organizational culture that supports knowledge sharing. (Bartol and Srivastava 2002) has stressed the roles of managerial practices and organizational culture in encouraging knowledge sharing.

According to Bollinger and Smith (2001) the success and failure of knowledge management strategies rest on the human behavior, it emphasizes on organisational culture, learning and sharing of knowledge, skills, expertise and experience. Schein (1986) observed culture as behavior control agent, it provides the norms of behavior to its employees. It gives a platform to stimulate the members voluntary behavior to transfer knowledge, experience and skills into organisational assets, thus it helps in creating knowledge base and sustainable organisational development. McDermott and O’Dell (2001) often seen organizational culture as a key inhibitor of effective knowledge sharing. It creates the framework for social interactions which determines situational knowledge use in the organizations. Culture nurtures the relationships between individual, group and at organisational level, it also shapes the process of knowledge diffusion within the organizations.

1.10. Innovative Work Behavior:

“Capacity to innovate” is the business success mantra for the organizations in this competitive world. Johnson et al (2008); Tid & Bessant (2009) and Gandotra (2010) identified innovation as a key element to gain sustainable competitive advantage. Volberda (1996) Hanssen-Bauer & Snow (1996) mentioned that cost effective technological development pushing organizations for flexible production and has caused competition between organizations. The growing recognition of innovation as powerful catalyst by scholars in the global market competition. The basic foundation for innovation is developing the “ideas” (Scott & Bruce, 1994). Exploitation and exploration are the two distinguished strategies for creating innovation. Exploitation is the optimal utilization of existing opportunities and exploration is searching new ideas. Individuals in the organizations has the capability to develop, modify and carryout the ideas (Van de Ven,1986). To innovate, organizations has to enhance the innovative work behavior of the its employees and it has to create an organizational culture which supports innovation.
Extensive research is going on in different fields to identify factors fostering innovation. Scott & Bruce (1994, 1998) and De Jong & Den Hartog (2010) suggest that organizations should engage their employees in innovative work behavior to get benefit from individual innovations. Ramamoorthy et al (2005) also identified the importance of individual innovation in organizations in its products, process and operations. From the works of West & Farr (1989); Kanter (1988), De Jong (2007) and Pieterse et al (2010) we can observe that innovative work behavior is influenced by many factors like individual, team, social interactions, organizational support for innovative efforts, organizational structure, leadership and other motivational factors. Hartjes (2010) also studied individual factors like task oriented, cognitive and ability to do. The individual and cognitive factors underlying in innovative work behavior is the growing area of research at individual level innovation (West & Farr, 1989; Scott & Bruce, 1994; Oldham & Cummings, 1996; and Amabile et al. 1996).

1.11. Innovative Work Behavior and Innovation:

Innovative work behavior (IWB) is identified as a discretionary behavior, which can be stimulated as an extra role behavior. (Katz and Kahn, 1978) identified extra role behavior as generating, promoting and realizing innovative ideas. West and Farr (1989) defined IWB as “the intentional creation, introduction and application of new ideas within work role, group, or organization, in order to benefit role performance, the group or the organization”. Schuler and Jackson (1987) points that IWB will not just help in improving individual innovation and organizational performance but also brings socio-psychological benefits like recognition, rewards, to enlarge skills, morale and greater commitment towards self and on the job. Organizations engaged in innovative work behavior are more tend to be producing new innovative products and process. Scott & Bruce (1994) divided this complex behavior into idea generation, idea promotion and idea realization. Kanter (1988) described the basic step for individual innovation is idea generation, which helps them in producing novel and useful ideas in different domains.

1.12. Research Problem:

“Indian agriculture is in a way, a victim of its own successful green revolution” as observed in economic survey of India (2015-16). The reflecting dark realities of Indian agricultural sector at present has been inflicted by Green revolution. The introduction of high yield varieties and fertilizers has brought increased productivity but in the long run, we
observed negative environmental factors. The present stagnant growth of agricultural production is because of lack of new technologies and major breakthrough innovations. Indian agricultural research system has played a significant role in fostering green revolution but there hasn’t been any breakthrough research in recent past. Along with environmental factors, there are other institutional factors ranging from lack of financial support, rising costs, lack of infrastructure, lack of strong supportive education system, poor diffusion of new technologies and practices, lack in networking the research institutions and so on. By recognizing the need for innovation and with an aspiration for innovation, Indian has declared “2010-2020” as the “Decade of Innovation”. The Government has stressed the need to articulate a policy to synergize science, technology and innovation and has also established the National Innovation Council. “Science technology and innovation for the people” is the new paradigm of the Indian STI policy. With an aim to positioning India among the top five global scientific powers by 2020 this research tries to identify the knowledge sharing promotional aspects of organization to foster agricultural innovation in ICAR institutions.

1.13. Research Purpose:

The research mainly focuses on examining the relationship between knowledge sharing and innovation. The study also considers the role of socio-organisational aspects in promoting knowledge sharing. The present competitive world is volatile and pushes the organizations for continuous innovation. In this aspect organizations are looking for driving forces to promote innovation. The literature identifies knowledge exists in individuals as the most precious intangible resource in promoting innovation and empirical evidences in the literature tells that organizations with a scope for share, disseminate and apply the existing knowledge are able to produce new knowledge i.e Innovation. Further, the need for identifying the organizational factors to promote the knowledge sharing is observed.

This issue is very common in research and development organizations. The very driving force for the research institutions is innovation. Since knowledge is considered as an important driving force for innovation, the study investigated the relationship between knowledge sharing and innovation. The study concerns with scientists of ICAR institutions. ICAR, being one of the largest agricultural research network in the world, the organization is not able to bring the breakthrough innovations. ICAR with a great potential to innovate is lagging in it. ICAR scientists with great knowledge can bring innovation through sharing, diffusing and using of
the existing knowledge. This research helps in finding the impact of organisational culture and social capital on knowledge sharing, which intern enhances the innovation.

Hence, this research work analyzes the knowledge sharing influencing socio-organisational factors in innovative context among scientists of ICAR. It is believed that tacit and explicit knowledge sharing have positive effect on both product and process innovations. The results implicate to promote the social capital aspects and organisational culture where it can share its knowledge in creation of innovation.

1.14. Significance of the Study:

The study contributed in extending the innovative literature in knowledge sharing aspects. The research focused on organisational and social aspects of knowledge sharing and second one is finding the impact of knowledge sharing on innovation. This study will create a significant impact on agriculture research in India. The collected responses from scientists were analyzed and the results helped us in understanding the impact of their knowledge sharing behavior in bringing the innovation. The important role of social capital dimensions (structural, relational and cognitive dimensions) and organizational culture on both forms of knowledge sharing (tacit and explicit knowledge sharing). This work is very significant and relevant in the present contest. This work is having its own significance in highly socialized country like India to utilize the high social capital. This study helps to find the knowledge sharing enablers in research and development institutions like ICAR where knowledge sharing plays a prominent role among highly knowledgeable scientists in different fields of agriculture, fisheries and animal science. Greater significance on the existing knowledge management system in ICAR.

1.15. Theoretical Framework:

The literature provides empirical evidence in establishing the relation between knowledge sharing and innovation. some works further extended their studies to check the relationship in different aspects of selected variables. There was a gap in research in establishing relationship between two different forms of knowledge sharing (tacit and explicit) and two forms of innovation (product and process). Though there was established relationship between social capital and knowledge sharing in the literature, there is a less explored are to find the effect of three dimensions of social capital (structural, relational and cognitive) and organisational culture on tacit, explicit knowledge sharing and innovative work behavior.
1.16. Limitations of the study:

There are certain limitations in this study,

- The study is confined to the ICAR research institutions located in Northern states of India.
- The data was collected from the scientists, since we collected self-reported responses there may be chance for biased response.
- The interpretations are based on onetime data collection.
- The study limited to uni-directional relationship among the study variables.
- Confidentiality issues due to scientific research environment.

1.17. Schema of the Thesis:

The research work is mainly concerned with knowledge sharing in ICAR institutions. This research work mainly highlights the impact of explicit knowledge sharing and tacit knowledge sharing on both product and process innovations. Secondly, it finds the impact of organizational culture and three social capital dimensions on both tacit and explicit knowledge sharing. The detailed procedure followed in the research work, methodology, analysis of data, interpretation of results and future directions are documented in five
chapters. These five chapters helps the individuals in constructively finding the relationship among selected variables.

**Chapter 1 - Introduction:** Explains the background of the research study, gives conceptual understanding and significance of these variables in the present context. Theoretical and conceptual clarity about the organisational culture, social capital (structural social capital, relational social capital and cognitive social capital) tacit and explicit knowledge sharing, innovative work behavior, product and process innovations.

**Chapter 2 - Literature Review:** Explored the available literature in the domain of Knowledge sharing, innovation, social capital, organisational culture and innovative work behavior. Highlighted and documented breakthrough events in respective studies. This chapter helps in finding the research gap.

**Chapter 3 - Research Methodology:** Clear methodology is adopted to carry out the research work. The details of research design, sampling used, mode of data collection, tools used to measure the variables and inter relationships among variables is presented in this chapter.

**Chapter 4 - Data Analysis and Interpretation of Results:** This chapter provides analysis of data. Starts with analyzing demographic profile of the respondents, preliminary analysis of data like reliability, normality, skewness and kurtosis. Followed by statistical analysis to check the proposed hypothesis and SEM to check the proposed structural models.

**Chapter 5 - Discussion of Research findings and Conclusion:** The findings of the research is presented in this chapter. It summarizes contributions of research and the theoretical and managerial implications of research. Chapter ends with direction for future research.

At the end of the thesis includes references given in the thesis and appendices with documents used in support of explaining the study.

**1.18. Operational Definition of Subject Variables of The Study:**

The operational definitions of the study variables (organisational culture, social capital dimensions-structural, relational & cognitive dimensions, tacit & explicit knowledge sharing, innovative work behavior, product and process innovations) is given below.
• **Organisational Culture:** Shared values and norms that exist in an organization which involve common beliefs, feelings, regularities of behavior and a historical process for transmitting values and norms

• **Social Capital:** The resources, support, or services gained by simply being part of a group, or extended network by virtue of one’s network position.

• **Structural Dimension:** Social capital resides in social networks that are cluster of relationships between people. (the density and connectivity of the network and frequency of interaction)

• **Relational Dimension:** Describes the kind of personal relationships people have developed with each other through history of interactions

• **Cognitive Dimension:** This dimension consists of the shared mental models and narratives that enable effective

• **Explicit Knowledge Sharing:** It assumes that the useful knowledge of individuals in an organization can be articulated and made explicit. These knowledge assets can then be disseminated within an organization through documents, drawings, standard operating procedures, manuals of best practice, and the like

• **Tacit Knowledge Sharing:** This knowledge is essentially personal in nature and is therefore difficult to extract from the heads of individuals. It assumes, often implicitly, that the knowledge in and available to an organization will largely consist of tacit knowledge that remains in the heads of individuals in the organization.

• **Innovative Work Behavior:** The behavior typically includes creation of new ideas by exploring the opportunities and also includes improving the existing process or products by applying new knowledge.

• **Product Innovation:** The introduction of a good or service that is new or has significantly improved characteristics or intended uses. We shall think of product innovation as an improvement in the quality of a firm's product (e.g. the introduction of a high yield variety)

• **Process Innovation:** It refers to the implementation of a new or significantly improved production or delivery method. Process innovation will be interpreted as a reduction in the firm’s costs and time.
1.19. Summary:

This chapter has briefed the background of the research, the critical role of knowledge as an intangible asset for the organizations was explained and the importance of that knowledge sharing to bring the competitive advantage is also observed. Theoretical understanding about the knowledge, forms and types of knowledge, enablers for knowledge sharing, mechanisms of knowledge sharing in different organisational setups were discussed systematically through extensive literature. The organisational, social aspects of individual in influencing the knowledge sharing and innovation is given stress in the research. The growing research on the knowledge sharing and firm’s innovation in this technologically advanced market is highlighted by empirical evidences. The challenge for bringing sophisticated model for greater innovation in the research institution was presented. The chapter then proceeds to explain the purpose and significance of the research by highlighting the study variables. The research acknowledges the relationships between organisational culture, social capital dimensions, knowledge sharing, innovative work behavior in bringing the product and process innovations in the research organizations, particularly ICAR institutions in India. Finally, concluded with limitations in this research and defined the key terms. Next chapter gives the literary support to this research through extensive literature review.