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# Network Centrality and Individual Creativity: A Mediated Moderation of Knowledge Integration with Network Cost

Ahmad Adeel
Lahore Business School, The University of Lahore, Gujrat Campus, Pakistan
Email: ahmad.adeel@lbs.uol.edu.pk

Rizwan Ali (Corresponding author)
Lahore Business School, The University of Lahore, Pakistan
Email: Rizwan.ali@lbs.uol.edu.pk

Zhang Pengcheng
School of Management, Huazhong University of Science and Technology, China
Email: zhangpch@126.com

**Abstract**

This study examined peers' perceived central network position with supervisors' rated individual creativity. Employing three sources of data collection technique consist of 286 employees, subordinate-colleague dyads, and their respective 40 supervisors. We collected data from the employees working at controlling offices of a private commercial bank and analyzed proposed hypothesis with hierarchical analysis technique using random coefficient regression with Mplus 7.0. Employees of our sample were working in groups of 6-9 members per workgroup. Overall employees of these work groups represent higher hierarchical level employees of the bank. We examined that, network centrality is related with individual creativity directly and via mediation of knowledge integration; network cost moderated the relationship between network centrality and individual creativity and knowledge integration, however, knowledge integration mediated the relationship between the interaction of network centrality and network cost and individual creativity. Our results revealed that knowledge integration is a consequence of central network positions while network cost negatively affect creativity of centrally positioned employee. Centrally positioned employee can attenuate the negative effects of network cost by integrating knowledge available to him/her due to privileged central network position. We contributed to literature by introducing knowledge integration as a novel predictor of network centrality, network position can have both benefits and costs attached at the same time, and network position holders can enjoy knowledge benefits only when he/she has less network cost.

**Keywords:** network centrality, knowledge integration, network cost, employee creativity, social capital theory, banking sector.

## 1. Introduction

Creativity, is generating ideas that can be categorized as novel and useful (Amabile, 1988), is critical for performance (Oldham & Cummings, 1996; Gong et al., 2009; Tang & Ye, 2015), determinant of long-term survival (Shalley et al., 2004), and became source of distinct competitive advantage (Anderson et al., 2004; West, 2002; Zhou & Shalley, 2003) for organizations. Management researchers and practitioners showed strong interest in the field by investigating the factors which contribute to employees' creativity. Initially, creativity was conceptualized as individual level psychological phenomenon (Barron & Harrington, 1981; Amabile, 1983, 1988), therefore, focus of the researchers remained with the motivational aspects of creativity (Barron & Harrington, 1981; Zhou, 2003 for review); this motivational view set stage for researchers to identify contextual factors that can enhance or impede creativity (e.g., Oldham & Cummings, 1996; Eisenberger & Armeli, 1997; Shalley & Perry-Smith, 2001) by affecting directly or indirectly intrinsic motivation of individuals (Deci & Ryan, 1980, 1985; Zhou, 2003 for review). All of the contextual factors which have been studied for intrinsic motivation aspect of creativity have two potential functions: informational or controlling, these two aspects independently or in combination can affect creativity of individuals (Zhou, 2003 for review).

Recently, social aspects are recognized as important determinants of creativity (Obstfeld, 2005; Madjar & Ortiz-Walters, 2008; Baer, 2010; Rosing, Frese & Bausch, 2011; Liu et al., 2016). Researchers found that support of others is related with creativity and innovation: the implementation of creative ideas (Madjar et al., 2002; Axtell et al., 2000); stems in social networks, social support can foster creativity (e.g., Perry-Smith, 2006, 2014; Obstfeld, 2005; Carnabuci et al., 2015). Unique, diverse, and valuable knowledge resources are embedded in social networks (Mehra et al., 2001; Sparrowe et al., 2001; Wasserman & Faust, 1994); these knowledge resources are valuable for effectiveness (Wegner, 1987; Wegner et al., 1991), needed for decision making (Lewis et al., 2005; Liang et al., 1995), helpful for obtaining required objectives (Bunderson & Sutcliffe, 2002; Drach-Zahavy & Somech, 2001), affective for performance (Stasser et al., 1989; Stasser & Titus, 1985, 1987), and integral part of creativity (Amabile, 1988; Oldham & Cummings, 1996). These unique knowledge resources reside in social networks and can only be accessed by privileged network positions of social networks (Mehra et al., 2001; Sparrowe et al., 2001) for creativity (Hirst et al., 2015). Taking knowledge perspectives, some researchers explicitly examined central network positions and their impact on generation of creative ideas (e.g., Burt, 2004; Fleming et al., 2007); researchers found that due to quick and easy access to knowledge resources of social networks (Mehra et al., 2001; Sparrowe et al., 2001; Wasserman & Faust, 1994) and by taking benefits from diverse information and knowledge resources of those networks (Aral & Van Alstyne, 2011; Burt, 2004) employees of central network positions combine diverse and apparently unrelated information for creativity (Amabile, 1996; Burt, 2005; Fleming et al., 2007; Zhou et al., 2009; Perry-Smith, 2006, 2014; Dong & Yang, 2016). Yet, some researchers taking another view questioned this link; these researchers argue that central network positions impede knowledge exchange and motivation for creativity which can negatively affect generation of creative ideas (Tang & Ye, 2015). A dilemma result, central network positions which provide access to knowledge and information resources

for creativity, at the same time also impedes knowledge exchange and motivation for creativity which entails creativity.

Furthermore, knowledge resources are crucial for creativity (Amabile, 1988; Oldham & Cummings, 1996; Tang & Ye, 2015) but only limited number of researchers have investigated knowledge related benefits of central network positions for creativity (Burt, 2004; Fleming et al., 2007). With knowledge benefits, central network positions also bring cost in form of reduced performance and restrictions on individual freedom (Leana & Van Buren, 1999; Portes, 1998). Although not directly investigating cost of central network positions, researchers found that number of outside ties had a positive effect on creativity for more peripheral individuals but was negative for those occupying central network positions (Perry-Smith, 2006), also when ties were weak and networks were diverse, network size had inverted-u shaped effect on creativity (Baer, 2010). Therefore, it is important to investigate knowledge benefits along with the network cost for central network positions and creativity at organizations which may solve above dilemma. In this research we tried to investigate network benefit and cost in a single study by offering a mediated moderation model to explore how negative effects of network cost for central network position is mitigated by knowledge benefits for individual level creativity at organizations.

Taking access-motivation framework of social capital theory (Bourdieu, 1987; Nahapiet & Ghoshal, 1998), we will investigate knowledge benefits attached with central network positions and taking resource consumption perspective of theory of cognitive resource allocation (Kanfer & Ackerman, 1989) and theory of bounded rationality (March & Simon, 1958; Simon, 1945), we will investigate network cost of central network positions. Integrating these theories, we develop the argument that although central network positions bring maintenance cost but due to easy access to knowledge resources and involvement in knowledge exchange activities, individuals of central network positions integrate more knowledge which in turn is related with creativity at organizations.

By answering above question, this study is likely to make several contributions to literature and managerial practices. First, we extend the literature on social networks by investigating how privileged central network positions are related with knowledge integration at organizations. To the extent, social network positions dealt with knowledge, it has typically been linked with knowledge sharing while taking motivational perspectives (Gupta & Govindarajan, 2000; Burt, 1997; Granovetter, 1973; Hansen, 1999; Reagans & McEvily, 2003) or knowledge access benefits (Mehra et al., 2001; Sparrowe et al., 2001; Wasserman & Faust, 1994) for network positions. In this stream, researchers ignored the effect on knowledge integration while being at central network positions. Also, most of research on knowledge integration (Alavi & Tiwana, 2002; Kozlowski et al., 1999; Kenney & Gudergan, 2006) or knowledge management (Zack et al., 2009; Marque´s & Simo´n, 2006) dealt with teams or organizational levels of analysis. Although, some researchers specifically investigated knowledge integration of individuals (Tiwana, 2008) but their focus remained with abilities of individuals to integrate knowledge. Enhancing scope of central network positions for knowledge related research; we uncovered knowledge integration as a consequence of central network positions instead of ability of individuals.

Second, past research suggest that central network positions are positively related with knowledge provision and knowledge acquisition (Reinholt et al., 2011), to some extent we may relate these to knowledge integration, in such studies network cost of central network positions are not taken into consideration. This omission is critical because there is evidence available in the literature that network positions also holds high maintenance cost (Leana & Van Buren, 1999; Portes, 1998; Verbeke & Wuyts, 2007). This argument suggests that central network position holders' efforts for making social ties will also bring cost in form of consuming finite cognitive resources which may affect knowledge integration and creativity at organizations. This issue is highly significant for both theory and practices. Third, taking knowledge integration perspective and network cost together in one research we contribute to creativity literature by explaining the mechanism by which network centrality is related with creativity at organizations. An investigation of these relationships is likely to contribute to creativity literature and understanding of the researchers about the possible knowledge related benefits and network related cost as antecedents of creativity. One interesting insight is that central network positions are related with creativity through mechanism of knowledge accumulation by central network position holders.

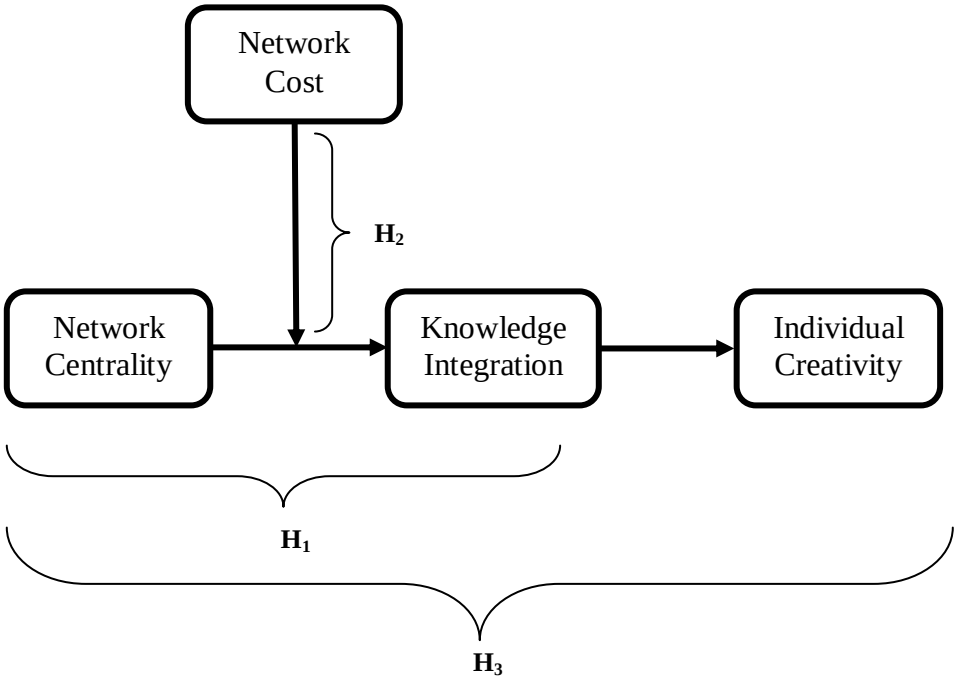


**Figure 1: Research Model**

## 2. Literature Review and Hypothesis

### *2.1 Social Capital: An Overview*

Social capital a term first appeared in community studies highlighted the networks for development of trust, cooperation, and collective actions (Jacobs, 1965), the

unidirectional view conceptualized the significance of social relations as a resource for social actions (Baker, 1990; Bourdieu, 1987; Burt, 1997; Coleman, 1988, 1990; Jacobs, 1965; Loury, 1987), however, some researchers further enhanced scope of the term by conceptualizing the actual and potential resources that can be accessed through these networks (Bourdieu, 1987, 1993; Putnam, 1995). Thus, social capital is "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" (Nahapiet & Ghoshal, 1998). Social capital theory depicts that social networks constitute valuable resources for conduct of social affairs (Bourdieu, 1987). Interaction with others is prerequisite for development and maintenance of social capital (Bourdieu, 1987); these interactions and network links describe number of nodes in a network for an actor which creates base for social capital. Therefore, social capital consists of social relationships, social network, and the assets that can be mobilized and accessed using that network (Bourdieu, 1987; Burt, 1997). Structural dimensions (networks and their positions) of social capital facilitate the creation of new knowledge base by making knowledge resources accessible and by motivating actors to exchange these knowledge resources (Nahapiet & Ghoshal, 1998). Social capital theory depicts that access to knowledge and motivation to exchange knowledge is needed for knowledge accumulation and creation of new knowledge base (Nahapiet & Ghoshal, 1998). Based on social capital theory, the main argument we develop here is that access to knowledge resource and motivation for involvement in knowledge exchange activities help central network position holders in integrating knowledge.

*2.2 Network Centrality and Knowledge Integration*

Social capital of individuals helps in accessing tacit/explicit and social knowledge (Spender, 1996); although, information and knowledge resources of networks are costly to gather (Coleman, 1988) but social capital makes these valuable resources easily available by reducing time and energies needed to access these valuable knowledge resources (Burt, 1997). These valuable and deeply embedded scarce knowledge resources of the networks (Nahapiet & Ghoshal, 1998) can only be accessed through social relations of that network (Bourdieu, 1987). Each relation of focal employee in a social network represents unique way through which he/she can exchange knowledge (Anderson, 2008). Employees in central network positions are privileged to quick and easy access to more nodes than others for information and knowledge exchange which opens new opportunities for focal employee to gain access to shared knowledge (Tsai, 2001).

Network positions provide access to knowledge and information resources of the network but without motivation to exchange knowledge central network position holders will not be able to take benefits of knowledge resources available to them due to their privileged network position (Reinholt et al., 2011). Motivation to exchange knowledge is endogenous to network structures (Burt, 1997; Granovetter, 1973; Reagans & McEvily, 2003), predict involvement in knowledge exchange activities (e.g., Gupta & govindarajan, 2000; Hansen et al., 2005; Szulanski, 1996) and influence knowledge sharing of central network position holders (Reinholt et al., 2011). Symmetrical social ties influence individual motivation for social interactions and knowledge exchange (Krackhardt, 1992; Lawler & Yoon, 1996). Although access to knowledge resources is important, motivation to exchange knowledge affects the knowledge acquisition and

provision by centrally positioned individuals (Reinholt et al., 2011). Social networks generate many nodes in real settings, these network nodes can learn by involving in knowledge activities and using this knowledge for performance improvements (Hollingshead, 1998; Lewis et al., 2005; Liang et al., 1995; Moreland et al., 1996; Moreland & Myaskovsky, 2000). So, the more you involve in knowledge exchange activities the more you will integrate knowledge from these exchanges. Having central network position predicts involvement in knowledge activities in a positive way (Anderson, 2008; Burt, 1997; Freeman, 1979; Tsai, 2001). On the other hand, employees not centrally positioned in their networks get fewer chances to involve in knowledge exchange activities (Wasserman & Faust, 1994).

Therefore, as a consequence of their easy access to knowledge resources, extensive involvement in knowledge exchange activities, and motivation for exchange knowledge, centrally positioned employees are likely to integrate more knowledge than others who lack to gain central network positions and left their network knowledge resources untapped. Network centrality as a central property of network is hub and center of most of the knowledge and information transmitted in that network (Freeman, 1979). Therefore, we hypothesize here that central network position is positively related with knowledge integration. Formally:

- **$H_1$:** Network centrality is positively related with knowledge Integration.

*2.3 Moderating Role of Network Cost*

Individuals put efforts to establish network nodes which help them to access beneficial network positions establishing network nodes for these positions (Burt, 2004), and obtaining network resources better than others (Ferris et al., 2005). These efforts are seen positively related with performance, knowledge, and information benefits (Burt, 2004; Ferris et al., 2005; Blickle et al., 2011; Hochwarter et al., 2007; Jawahar et al., 2008). These established networks and their positions can have maintenance cost; Theory of cognitive resource allocation (Kanfer & Ackerman, 1989) and theory of bounded rationality (March & Simon, 1958; Simon, 1945) explain how invested cognitive resources in one activity will lead other activities suffer. According to these theories individual performance can mainly be determined by amount of cognitive resources invested for that activity. Individual's allocated resources for performance of some core activity will be subtracted from the overall cognitive resources. So, deduction from static cognitive resources will lead to remain less for other activities. In social settings most relations are defined by individuals' exchange relationships (Blau, 1964; Emerson, 1976; Gouldner, 1960). Theories of relationship formation explained that social relations are based on the norm of interdependency and reciprocity (Reis, Collins, & Berscheid, 2000; Thibaut & Kelley, 1959). More network nodes mean more reciprocity in relationships and more consumption of cognitive resources. Central network position holders are characterized as those with numerous network ties (Wasserman & Faust, 1994), these numerous network nodes will necessitate that centrally positioned employee will remain less for his/her core activities. This consumption of finite cognitive and time resources will not let him/her take benefits of knowledge resources available to him/her due to beneficial network position. So, we hypothesize here that network cost will negatively affect the relationship between network centrality and knowledge integration. Formally:

- **$H_2$:** Network cost will moderate the relationship between network centrality and knowledge integration.

*2.4 Mediating Role of Knowledge Integration*

Getting benefits from different knowledge resources of social networks for team and individual effectiveness is not new to research. Different researchers addressed this issue; transactive memory system, functional diversity, and information pooling are three well developed and widely accepted streams of knowledge research. These three streams of research highlighted how individuals access knowledge from their work units and networks. Transactive memory system explains that shared knowledge in teams emerge from mutual learning, storing information with experts, and retrieving valuable information from them (Wegner, 1987; Wegner et al., 1991) and is vital for team effectiveness (Lewis et al., 2005; Liang et al., 1995). On the other hand, functional diversity examines the functional dissimilarities among team members and how these can facilitate to obtain required objectives (Bunderson & Sutcliffe, 2002; Drach-Zahavy & Somech, 2001). And finally, information pooling approach uses interaction as a way to exchange unshared information in groups (Stasser et al., 1989); consequences in form of reduced performance if that information might remain unshared (Stasser et al., 1989; Stasser & Titus, 1985, 1987). Research in these three areas highlighted that how affective performance can be achieved by transforming and integrating individual team member's knowledge (Bunderson & Sutcliffe, 2002; Cummings, 2004; Huckman & Staats, 2011). So, these three research streams have three conclusions: Individual's problem-solving quality can be improved when 1- he/she possess broad and right type of knowledge for problem in hand. 2- Outcomes are better when he/she has access to diverse pool of knowledge. 3- Access to distributed knowledge and then transformation of this knowledge will increase his/her effectiveness. Therefore, by anyway of accessing knowledge from the network of people and then integrating it for further problem solving is effective for individual problem solving and performance. Information pooling approach specifically links social interactions for acquiring valuable information and knowledge for performance related outcomes.

Information and knowledge exchange enhance creativity by providing cognitive resources needed for creativity (Amabile & Khaire, 2008). Exchange of work-related information, knowledge, and ideas for creativity were also found positively related with creativity (Bunderson & Sutcliffe, 2002; Johnson et al., 2006). Researchers found that those individuals who provide unique and novel solutions to problems often fail (Fleming, 2001; Simonton, 1984) but their failure can be mitigated by intensive involvement in knowledge activities and increasing knowledge base for further problem solving (Amabile 1988, Basudur et al., 1990), involvement in knowledge activities for increasing knowledge base improve knowledge generation and problem solving (Gong et al., 2013; Hargadon & Bechky, 2006; Nonaka, 1994; Srivastava et al., 2006; Tiwana & McLean, 2005). Knowledge management activities (Xu et al., 2010; Darroch, 2005; Carneiro, 2000) and Knowledge processes (Tatiana & Aino, 2011) can also affect implementation of creative ideas at organizations. The preceding hypothesis link the relationship among the interaction of network centrality and network cost, knowledge integration, and individual creativity. Implicitly, the discussion suggests that the interaction effect of network cost and network centrality on individual creativity is mediated by knowledge integration of individuals. That is, network centrality as a structural property of networks allow focal employee to extensively involve in knowledge exchange activities and as a consequence focal employee integrate more

knowledge from these exchange activities, which in turn, is related with employee creativity at organizations. Thus, this study argues that knowledge integration partially mediates the relationship between the interaction of network centrality and network cost on individual creativity at organizations. Following these lines of reasoning, we proposed following hypothesis.

- **$H_3$:** Knowledge integration will partially mediate the interactive effect of network centrality and network cost on individual creativity.

## 3. Methodology

### *3.1 Sample and Data Collection*

Data was collected from 412 employees and their respective 55 managers working at different controlling offices of a private commercial bank operating in Pakistan. Employees of our sample were working in groups of 6-9 members per workgroup. Overall employees of these work groups represent higher hierarchical level employees of the bank. We discussed purpose of this research with bank's management and with their approval we started our data collection process. Employees of the bank had assigned computers which made our data collection process easier. Bank is using a portal for employees' mutual learning; all of the employees are members of this portal; sometimes employees also provide feedback on different issues as needed by bank. So, employees were already aware of data collection, however, study and its purpose were not explained to the participants. With help of HR department of the bank we tagged each employee's id with relevant questionnaire on that learning portal and they then provided their individual response using that portal. One of the authors is also a full-time employee of that bank, we did not collect data from his work unit, and his presence as an author was also not disclosed to any of the respondents. HR department of the bank independently collected data using learning portal of the bank and completed surveys emailed directly to one of the authors of this study. It is also important to mention that the results presented in table 1 and tables 2 are part of a large investigation.

Three sources: Self reporting, peer reporting, and supervisor reporting measures were used in this study to collect data. Knowledge integration and network cost were measured using self-reporting measures. Peer perceived network centrality in work groups was used to measure centrality of each workgroup. Respondents were asked to rank all of the coworkers for whom they seek work related, professional, or advice for important work related decisions. Each and every employee was asked to recall and rank each member of his/her team on network centrality scale. And finally, supervisors ranked each member of their work unit on the individual creativity scale. Data with missing values were dropped which yielded a final sample of 286 members within 40 work units. In our final sample of subordinates 76% were men and 24% were women, 31 % of the employees had a bachelor degree and 69% of the employees were master degree holders, current bank's experience was 6.28 years, total banking experience was 9.76 years and working experience with current team was 2.05 years.

**Table 1: Descriptive Statistics and Correlations among Variables**

| Variable | Mean | SD | Gender | Education | COE | TE | MTT | NC | NC | KI |
|---|---|---|---|---|---|---|---|---|---|---|
| Gender | 0.76 | 0.426 | 1 | | | | | | | |
| Education | 2.69 | 0.464 | -0.021 | 1 | | | | | | |
| COE | 6.28 | 2.80 | 0.124* | -.043 | 1 | | | | | |
| TE | 9.76 | 4.61 | 0.184** | -.024 | .613** | 1 | | | | |
| MTT | 2.05 | 0.782 | 0.064 | -.067 | .217** | .213** | 1 | | | |
| NC | 1.03 | 0.684 | 0.089 | .259** | .210** | .284** | .117* | 1 | | |
| NC | 3.84 | 1.25 | 0.049 | .137* | -.011 | .014 | -.111 | .018 | 1 | |
| KI | 4.16 | 1.14 | -0.046 | .286** | -.112 | -.064 | -.032 | .162** | .101 | 1 |
| IC | 2.31 | 0.890 | 0.035 | .348** | -.205** | -.017 | -19** | .332** | .171** | .349** |

*Note: COE=Current Organization Experience; TE= Total Experience; MTT=Member's Team Tenure; NC=Network Centrality; NC= Network Cost ; KI= Knowledge Integration; IC= Individual Creativity;*

**p < .05, **p < .01*

*3.2 Measures*

3.2.1 Network centrality

Using standard survey techniques (Burt, 1997; Wasserman & Faust, 1994), we asked the respondents to provide the names of coworkers by answering the question "who is important source of professional advice, whom you approach if you have a work-related problem or when you want advice on a decision you have to make" (Ibarra, 1993). To mitigate chances of any social concern, we let the employees recall all the coworkers they go for advice seeking (Marsden, 1990, 1993). We also did not limit the number of advice sources for any coworker. Based on coworker's response, we then measured network indegree centrality (Freeman, 1979) using UCINET 6.347, consistent with recent trend in network studies (Bono & Anderson, 2005; Mehra et al., 2006) we captured the extent to which focal employee is sought to discuss organizational matters (Venkataramani et al., 2010). Higher within group response rate is required to measure indegree centrality because with low response rate we cannot firmly say that the results represent the actual centrality of the group (Costenbader & Valente, 2003). Using bootstrapping procedure, researchers found that the correlation between reported and actual centrality reduces when response rate is below 50% (Costenbader & Valente, 2003). In our sample, within-group response rate was above 70%, threshold in social network's research (Zohar & Tenne-Gazit, 2008).

3.2.2 Individual Creativity

Supervisors' ratings for creativity are most widely and commonly used in field studies (George & Zhou, 2001, 2002; Oldham & Cummings, 1996; Scott & Bruce, 1994; Zhou, 2003; Zhou & George, 2001). So, following previous literature, with supervisor rated individual creativity, we measured creativity of employees with three items five point likert-type scale (Janssen, 2001). Sample item is "How often does this employee searching out new working methods, techniques, or instruments". ($\alpha = .89$)

3.2.3 Knowledge Integration

Previous measures of individual level knowledge integration were developed to measure abilities of individuals to integrate knowledge. We adopted three items of individual level knowledge integration ability from Tiwana (2008) to measure knowledge integration of employees. These three items are "People seek my advice for their work related problems which helps me to blend new knowledge in this team with what I already know", "Having numerous social ties helps me to span several areas of expertise to generate new ideas", and "My social network ties help me to synthesize others' knowledge and ideas to solve problems well" ($\alpha = .93$)

3.2.4 Network cost

We were unable to find any suitable measure for individual level network cost which can be used in an organizational context. We adopted all the items from the original scale of individual level networking abilities (Ferris et al., 2005) to measure network cost. Using six-item, seven-point likert-type scale, we measured network cost. Scale items are "At work, I know a lot of knowledgeable people and I am well connected but they consume my energies and time", "I use my connections and networks to make things happen at work but I have to reciprocate in the same manner", "I have developed a large network of colleagues and associates at work who I can call on for support when I really need to get things done and I also have to reciprocate in the same manner", "I have to spend my time and energies in managing and developing connections with others", "Building relationships with influential and knowledgeable people at work is a time consuming activity", and "Sometimes I feel overburdened due to the time and energies I spend in my social network". ($\alpha = .97$)

3.2.5 Control Variables

Personal sources of power such as education and experience can affect new idea generation (Ibarra, 1993). We used education, current organization's experience, total working experience, and team tenure as control variables for this study. Due to heterogeneity in teams we also controlled for gender.

**4 Results and Discussions**

All study variables with Mean, Standard deviation, and correlation are shown in table 1. Although, due to network centrality measure, we have to collect data from the employees and supervisors of teams but our measures and analyses are purely at individual level with random coefficients. Our sample consisted of multiple teams working in bank which were further nested into different business and functional units so standard error estimation problem can emerge with this data. Muller et al. (2005) recommended hierarchical regression Analysis for mediated moderation models. So we used hierarchical analysis using Random Coefficient Regression with Mplus 7.0 to test our hypotheses and mediated moderation model. Mplus explicitly support analysis of nested group framework. On recommendation of Hofmann and Gavin (1998), we grand means centered all the variables before putting them into random coefficient regression analyses. Model fit test also performed using Chi-Square Test of Model Fit. We have to perform chi-square difference test as the output of nested group cannot be utilized to measure model fit. So, on recommendations of Muthén and Muthén (2012) we also performed Satorra-Bentler difference test using scaling factor. Table 1 shows that individual creativity is positively related with education ($r = 0.348$, $P<.01$), network centrality ($r =$

.332, P<.01), network cost (r = .171, P<.01), knowledge integration (r = .349, P<.01), and negatively related with current organizational experience (r = -.205, P<.01) and member's team tenure (r = -.193, P<.01).

Hierarchical Random coefficient regression analyses results of mediated moderation model are presented in table 2. There are three conditions which must be fulfilled to show mediated moderation model (Baron & Kenny, 1986; Muller et al., 2005). 1) Interaction term (Network Centrality and Network Cost) coefficients should be significant with dependent variable (Individual Creativity). 2) Interaction term (Network Centrality and Network Cost) coefficients should be significant with mediator (Knowledge Integration) when other predictors are controlled. 3) The coefficient of mediator should be significant with dependent variable when controlled for interaction of mediator and moderator (Knowledge Integration and Network Cost) and all other predictors; and when controlling for mediator and other predictor variables the coefficient of interaction term (Network Centrality and Network Cost) should show reduced magnitude (Partial Mediation) or become non-significant (Full Mediation).

We used all control variables along with network centrality as independent variable, network cost as a moderator, first interaction term representing moderating effect of network cost on relationship between network centrality and individual creativity and also on knowledge integration, individual creativity as a dependent variable, knowledge integration as a mediator and finally the second interaction term of network cost and knowledge integration. As shown in table 2 (model 1), the interaction of network cost and network centrality ($\beta$= -0.262, p< 0.01, $\Delta R^2$ = 0.60) had significant effect on individual creativity. These results fulfill the first requirement of mediated moderation model. The moderating effect is shown in figure 3. The interaction effect in figure 3 shows that the relationship between network centrality and individual creativity is weak when network cost is high and the relationship between network centrality and individual creativity is strong when network cost is low indicating that energies spent by centrally positioned employee in managing social network position and nodes will diminish results for the core activity (individual creativity).

In table 2 (model 2), network centrality ($\beta$= 1.655, p< 0.01, $\Delta R^2$ = 0.18) showed significant coefficient on knowledge integration supporting first hypothesis of our study and the interaction of network cost and network centrality ($\beta$= -0.377, p< 0.01, $\Delta R^2$ = 0.44) had also significant effect on knowledge integration fulfilling the second requirement of mediated moderation model and also supporting second hypothesis. Moderating effect in depicted in figure 4. Interaction effect in figure 4 shows that network centrality is positively related with knowledge integration when network cost is low and negatively related with knowledge integration when network cost is high. Indicating that finite cognitive resources spent in managing social network by centrally positioned employee will reduces individual cognition for integrating knowledge and also for taking benefits from the knowledge resources accessible due to his/her network position. Finally, in model 3 of table 2, the results revealed that knowledge integration has a significant mediating effect on individual creativity ($\beta$= 0.260, p< 0.05, $\Delta R^2$ = 0.62), while the interaction term representing the moderating effect of network cost reduced its magnitude ($\beta$= -0.233, p< 0.05, $\Delta R^2$ = 0.62) which meets the third and final requirement of mediated moderation model. These results indicate that knowledge

integration partially mediate the interaction effect of network centrality and network cost on individual creativity supporting hypothesis 3 of this study.

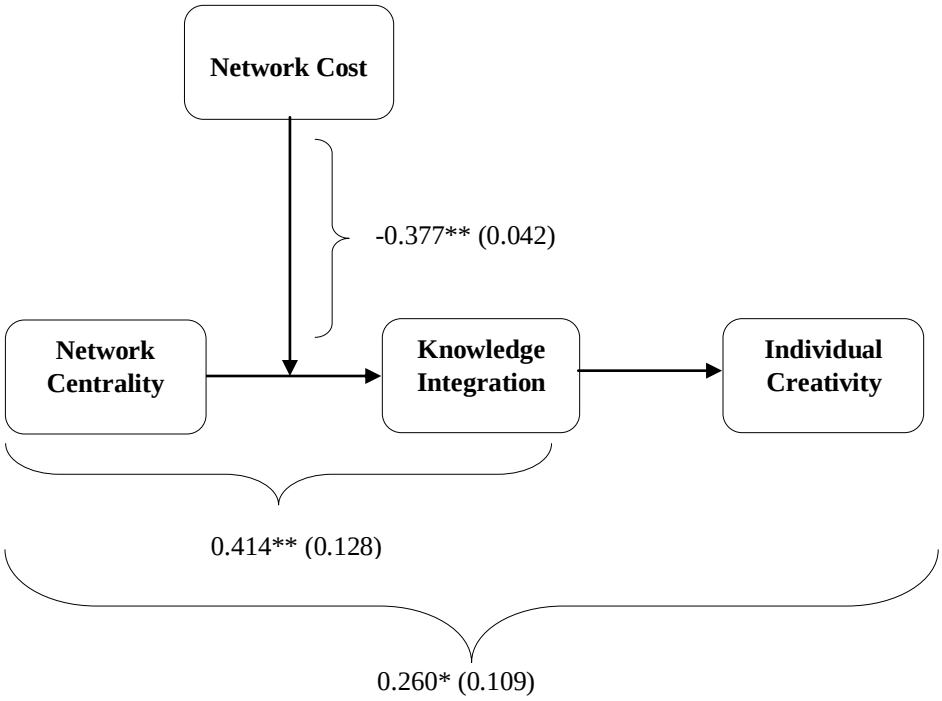


**Figure 2: Research Model along with Results**

**Table 2: Summary of Hierarchical Random Coefficient Regression Analysis**

| **Predictor** | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| | **Individual Creativity** | | **Knowledge Integration** | | **Individual Creativity** | |
| | Estimate | SE | Estimate | SE | Estimate | SE |
| Control Variables | | | | | | |
| Gender | 0.079 | 0.105 | -0.162 | 0.114 | 0.068 | 0.097 |
| Education | 0.392** | 0.124 | 0.459* | 0.200 | 0.282* | 0.137 |
| Current Org. Experience | -0.058** | 0.021 | -0.014 | 0.030 | -0.078** | 0.028 |
| Total Working Experience | 0.003 | 0.013 | -0.020 | 0.017 | 0.024 | 0.014 |
| Member's Team Tenure | -0.120 | 0.079 | 0.052 | 0.107 | -0.191 | 0.100 |
| Independent Variable | | | | | | |
| Network Centrality | 0.414** | 0.128 | 1.655** | 0.218 | 0.246* | 0.116 |
| $\Delta \chi$ 2 ($\Delta$df) | 53.48(5)** | | 34.08(5)** | | 75.09(6)** | |
| $\Delta R^2$ | 0.35 | | 0.18 | | 0.52 | |
| Moderator | | | | | | |
| Network Cost | 0.270** | 0.067 | 0.314** | 0.081 | 0.284 ** | 0.091 |
| Interactive Effect | | | | | | |
| Network Centrality X Network Cost | -0.262** | 0.042 | -0.377** | 0.042 | -0.233* | 0.042 |
| $\Delta \chi$ 2 ($\Delta$df) | 116.552(7)** | | 89.477(7)** | | 109.03(8)** | |
| $\Delta R^2$ | 0.60 | | 0.44 | | 0.62 | |
| Mediator | | | | | | |
| Knowledge Integration | | | | | 0.260* | 0.109 |
| $\Delta \chi$ 2 ($\Delta$df) | | | | | 104.16(9)** | |
| $\Delta R^2$ | | | | | 0.62 | |
| Interactive Effect | | | | | | |
| Knowledge Integration X Network Cost | | | | | 0.004 | 0.027 |
| $\Delta \chi$ 2 ($\Delta$df) | | | | | 103.059(9)** | |
| $\Delta R^2$ | | | | | 0.56 | |

*Note: $\Delta \chi$ 2 refers to Satorra-Bentler scaled chi-square difference test Muthén and Muthén (2012). $\Delta$ df is change in degree of freedom. $\Delta R^2$ is degree of reduction in error variance (Snijders, 2011).*

**p < .05, **p < .01*

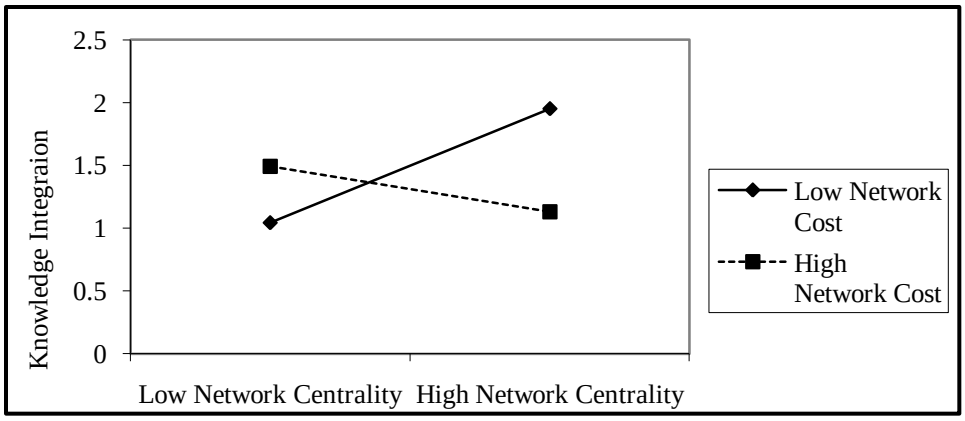


**Figure 3: Plot of Interaction between Network Centrality and Network Cost**

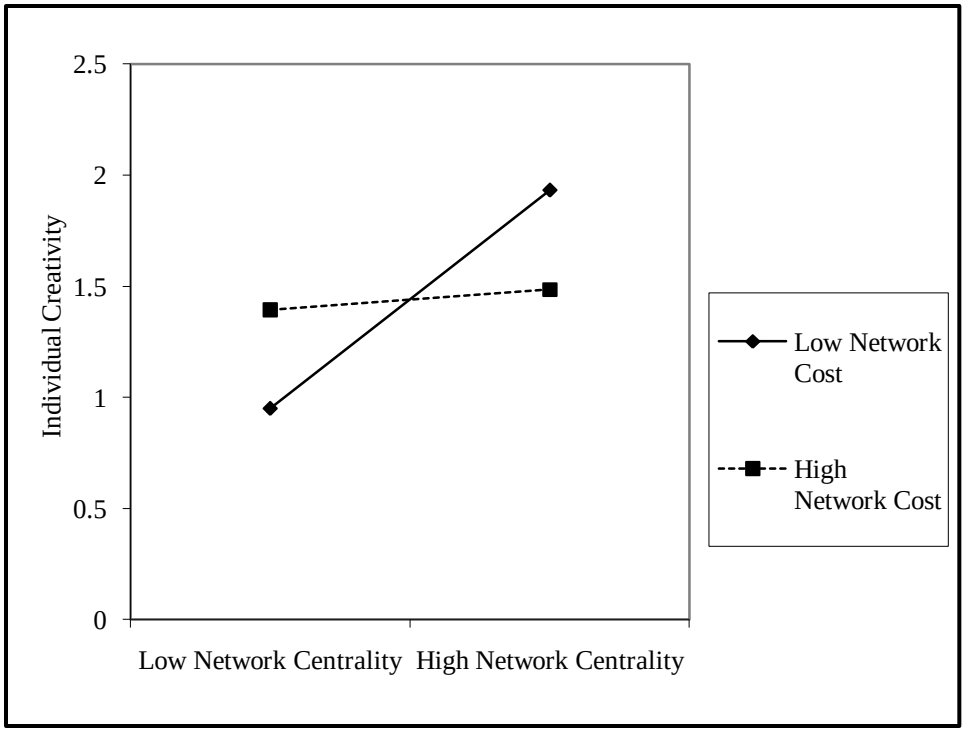


**Figure 4: Plot of Interaction between Network Centrality and Networking Cost**

Network centrality brings forth benefits in form of access to more diverse knowledge resources of social networks and costs in form of consuming finite cognitive resources by these networks for focal employee which may harm or help generation of creative ideas. In this study we focused network centrality for individual creativity and found support for both direct path and indirect path from network centrality to individual creativity through knowledge integration. We found that network centrality is positively related with

knowledge integration, indicating, due to access to more diverse knowledge resources and motivation to involve in knowledge exchange activities, centrally positioned employees integrate more knowledge. Although not hypothesized, we also found that network centrality is positively related with individual level creativity, indicating that central network positions provide resources needed for creativity of an individual.

However, the relationship is negatively moderated by network cost embedded in social networks and mainly attached with central network positions. This network cost negatively moderated the relationship between central network position and knowledge integration and also between central network position and individual creativity. Results of moderating effects of network cost revealed that network centrality is positively related with knowledge integration and individual creativity when network cost for focal employee is low rather than high. However, knowledge integration partially mediated the negative interaction effect of network centrality and network cost on individual creativity.

## 5. Discussion and Contribution

### *5.1 Theoretical Implications*

Main contribution of this study is the answering the question that how in spite of network cost, employees at central network positions generate creative ideas at organizations. We have built and tested a mediated moderation model that uniquely integrated social capital theory, theory of cognitive resource allocation, and theory of bounded rationality with creativity research.

Research on knowledge and central network positions mainly focused on access to knowledge (Mehra et al., 2001; Sparrow et al., 2001), motivation to exchange knowledge (Gupta & Govindarajan, 2000; Burt, 1997; Reagans & McEvily, 2003), or both with abilities to acquire and share knowledge (Reinholt et al., 2011). In knowledge research focus of researchers mainly remained with the abilities of individuals to integrate, acquire, or exchange knowledge either independently (Tiwana, 2008) or when they have central network positions (Reinholt et al., 2011). Consistent with recent trend of investigating consequences of structural properties of social networks (e.g., Cross & Cummings, 2004; Hansen, 2002; Reagans & Zuckerman, 2001; Carson et al., 2007; Zhang et al., 2012), leaving traditional way of investigating knowledge integration as ability of individuals, we focused knowledge integration as a consequence of structural properties of social networks: more specifically network centrality. Applying access-motivation framework of social capital (Bourdieu, 1987; Nahapiet & Ghoshal, 1998) in the context of structural network dimensions specifically network centrality we found that the knowledge integration is also a consequence of central network positions. By doing so we extended social network research related to knowledge and structural network properties.

Structural properties of social networks provide substantial benefits to network position holders (Cross & Cummings, 2004; Hansen, 2002; Reagans & Zuckerman, 2001; Carson et al., 2007). Cost attached with these structural properties in these social networks is rarely investigated in management research. We extended social network research by investigating the cost attached with social networks and its structural properties. Central network positions are also victims of high maintenance costs of social networks which in turn harm their creativity and chances to integrate knowledge available to them due to their privileged network positions. This addition to social network literature is

meaningful. We also followed recent trend of investigating social aspects of creativity (Obstfeld, 2005; Madjar & Ortiz-Walters, 2008; Baer, 2010; Rosing et al., 2011; Liu et al., 2016): specifically central network positions (e.g., Perry-Smith, 2006, 2014; Obstfeld, 2005; Carnabuci et al., 2015), Previous studies, which linked central network positions with performance related outcomes have showed varied results; for example, some researchers found that central network positions are positively related with creativity (Burt, 2004; Fleming et al., 2007). However, some researchers found that network centrality impedes creativity (Tang & Ye, 2015). In this research we addressed this dilemma; we investigated central network position with attached cost and attached benefits for creativity at organizations. Network cost can negatively affect individual creativity of centrally positioned employee on the other hand knowledge integration facilitate individual creativity. None of previous studies examined cost and benefits of central network positions in a single study as we did. By integrating knowledge benefits and network cost for central network positions, we provided mechanism by which central network positions are linked with individual creativity at organizations a distinctive addition to creativity literature.

*5.2 Practical Implications*

Organizations facilitate mutual learning of the employees (Huber, 1991) through social networks (e.g., learning and discussion forums, expert network groups, etc.,) which in turn improves organizational performance (Hansen, 2002). Specifically, organizations which highly foster network central positions demonstrate more diverse knowledge and are more innovative as compared to organizations which are low in fostering central network positions (Tsai, 2001). We found that in these social networks, network positions in general and network centrality in particular provides focal employee an opportunity to enhance possibilities to integrate knowledge which may further relate to individual creativity at organizations. Central network positions of social networks provide access to more individuals, their beneficial resources, and help in making beneficial social ties. But there is also cost attached with social network positions. We found that when network cost is high for central network position, holders of these positions find it difficult to generate creative ideas and integrate knowledge from the diverse knowledge and information resources available to them due to their privileged network position at organizations. Therefore, organizations' initiatives for mutual learning through social networks will not bring desirable results if employees involved will spend time in networking with others only instead of taking benefits from diverse knowledge resources of these social networks. So organizations should also consider this limitation when facilitating social networks for enhancement of individual, group, and organizational creativity. One solution to the problem is to foster activities which generate knowledge, enhance knowledge and information exchange, and bring tacit/explicit knowledge out for mutual benefits. Knowledge discussion forums for employees on bank's portal will also help in generating, exchanging, and acquiring diverse knowledge for benefits of the employees and also for the organization. Short term online courses and knowledge related quizzes with tangible and intangible rewards will also be a good motivator for employees to acquire more knowledge from their surroundings.

Moreover, it seems that central network position holders who generate creative ideas at organizations although they spend time in networking with others but at the same time, they also integrate knowledge from the knowledge resources available to them due to

their privileged positions. Specifically, social networks may help central position holders in making beneficial social ties but consumes cognitive resources which harm their creative performance, however, central network position holders if take benefit of network knowledge resources by integrating knowledge available to them can attenuate the negative effect for higher creativity at organizations. Management should also consider cost and benefits attached in fostering social network positions for creativity when developing environment which spawns social network positions for creativity of employees. Trainings about how to access, acquire, exchange, and integrate knowledge from social networks by reducing network cost embedded in social networks will also bring more creative output of individual employees. Individuals' creative performance is needed by organizations (Amabile, 1988; George, 2007). Therefore, it was critical to investigate real life employees for creativity at organizations. We selected employees who were working at different controlling offices of the bank. Managerial level employees are very critical for organizational performance (Finkelstein & Hambrick, 1996). Therefore, findings of non-managerial employees cannot be generalized to higher hierarchical levels (Cohen & Bailey, 1997; Gibson, 1999). With our results, we also provided support to previous research on structural properties of social networks, knowledge management, and creativity which was previously lacking support from managerial level investigations.

*5.3 Limitations and Future Research Direction*

Like other research, this study is also not free from limitations. First, although, we have strong theoretical reason to expect that network centrality would precede knowledge integration and individual creativity at organizations but with results from cross sectional design of this study we cannot firmly conclude that network centrality would precede knowledge integration and individual creativity at organizations and we cannot directly rule out the possibility of reverse causation. It is possible that an employee with high level of knowledge integration and creativity might precede development of many social ties and gain central network position in his/her work unit. So, for firm evidence of causation, further studies should explore the directionality of the relationship between network centrality and knowledge integration by temporally collecting data at different points in time.

Second, we investigated network centrality as an important structural property of social networks and its relation with knowledge integration. Researchers found that opportunities to access knowledge resources of networks differ based on the size of network (Burt, 1997; Cross & Cummings, 2004; Obstfeld, 2005). Therefore, it would be highly valuable if future research continued to investigate structural properties and their relationship with knowledge integration of individuals along with efforts to make social ties like network cost, focused impression management, and interpersonal influence in both large, open ego centric networks and small, strongly tied networks. These types of investigations will clear more dynamic picture of knowledge benefits and network costs associated with central network positions which may further relate to his/her creativity at organizations.

*5.4 Conclusion*

In spite of limitations, results of our research provided new insights into the relation between knowledge integration of individuals and network cost. Coworker's perceived

network centrality and creativity of individuals, and the effects of network cost on coworkers perceived network centrality, knowledge integration of individuals as well as on supervisor's perceived individual creativity at organizations. Our findings revealed that knowledge integration is also a consequence of central network positions. Network positions can have attached benefits and costs at the same time; network position holder can enjoy the knowledge benefits of his/her position for his/her creative output; individuals with high network cost will less likely to enjoy the knowledge benefit of their network positions. Organizations' initiatives for mutual learning through social networks will not bring desirable results if employees involved will spend time in networking with others only instead of taking benefits from diverse knowledge resources of these social networks. Therefore, organizations should also consider this limitation when facilitating social networks for enhancement of individual, group, and organizational creativity. Other dimensions of network cost and benefits attached with structural properties of social network, and cost attached with structural configuration of networks will be fruitful area for future research.

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