

# Extrinsic and Intrinsic Motivations as Mediator of Big Five Personality and Knowledge Sharing

Namita Rajput<sup>1\*</sup> and Amogh Talan<sup>2</sup>

<sup>1</sup>SRI Aurobindo College, University of Delhi, New Delhi India; Namitarajput27@gmail.com

<sup>2</sup>College of Vocational Studies, University Of Delhi, New Delhi, India; amoghtalan@gmail.com

## Abstract

The purpose of this research is to examine the interrelationships among various interpersonal psychological factors to explain their effect on knowledge sharing behaviors at workplace. A sample of 450 employees was drawn from knowledge based industries. To tap the information regarding performance on knowledge sharing, Big Five personality, and motivation, Knowledge Sharing Behavior (KSB) scale by Yi (2009)<sup>62</sup>, Big Five personality traits scale by Gosling et. al. (2003)<sup>27</sup>, extrinsic and intrinsic motivation scale by Lin (2007)<sup>40</sup>, were used. 'Partial Least Square' technique of 'Structural Equation Modeling' was applied using 'SmartPLS 2.0.M3' to understand the proposed relationships. Findings show the prominence of conscientiousness among 'Big Five personality traits' to explain knowledge sharing behaviors at workplace (Total Effect of 'conscientiousness' on 'knowledge sharing' being 0.5246 significant at  $p < 0.01$ ). 'Intrinsic motivation' is found to be a better predictor of 'knowledge sharing' than the 'extrinsic motivation' (Total Effect of 'intrinsic motivation' on 'knowledge sharing' being 0.3195, while that of 'extrinsic motivation' on 'knowledge sharing' being 0.1274, both significant at  $p < 0.01$ ). Both 'extrinsic' and 'intrinsic motivation' were found to mediate the relation between certain 'personality traits' and 'knowledge sharing'. Although the paper has certain limitations, nevertheless, this is the first study to consider the relationship between 'personality', 'motivation' and 'knowledge sharing' in a single study and making us understand the interacting and mediating role of 'motivation' to explain 'knowledge sharing'.

**Keywords:** Knowledge Sharing, Motivation, Mediation, Personality

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## 1. Introduction

Knowledge sharing has been shown to reduce costs in organizations, promote new product developments, improve group dynamics, and increase organizations' competitive abilities. (Cummings, 2004)<sup>13</sup>.

Nevertheless, promoting knowledge sharing in the organization can be a challenging procedure. At the individual level, it may give rise to a feeling of losing a valuable personal asset (Argote et al., 2001)<sup>3</sup>. Promoting the conception of new knowledge and its sharing is one of the challenges faced by today's managers (Kogut and Zander, 1992)<sup>37</sup>. Various interpersonal factors impair the intention and ability of persons to share knowledge, resulting in the failure of even the most advanced knowledge administration frameworks adopted by the organizations meant to promote knowledge sharing (Bock et. al. 2005)<sup>5</sup>.

Knowledge Sharing can be researched within several contexts including organizational and cultural, interpersonal and group characteristics, or motivational (Wang, S., & Noe, R. A. 2010)<sup>58</sup>.

Research on knowledge sharing at individual level have been conducted in information sciences (Wasko & Faraj, 2005)<sup>60</sup>, stra-

tegic management (Reagans & McEvily, 2003)<sup>51</sup>, organizational behavior (Bordia et al. 2006) and psychology (Lin, 2007b, c, d). One of the reasons why the knowledge management systems implemented in the organizations fail is the dearth of concern regarding the interpersonal factors that influence the knowledge sharing in individual or organizational settings (Voelpel, Dous, & Davenport, 2005)<sup>57</sup>.

Several factors are known to indirectly or directly affect the psychology of knowledge sharing. These factors may include management characteristics and administrative interventions such as incentives or rewards aimed to stimulate knowledge sharing (Cabrera & Cabrera, 2002)<sup>6</sup>; environmental characteristics (Levin and Cross, 2004)<sup>39</sup>; and the characteristics of the individuals who are owners of the knowledge such as the strength of association with the organization, interpersonal trust in peers and management, and the sources of motivations, which will ultimately assist them on deciding whether to conceal or share their knowledge (Levin and Cross, 2004).

Various researchers have shown an insight into the psychology of knowledge sharing at individual level. Knowledge sharing

has been shown to be influenced by interpersonal factors such as personality, emotional intelligence, work engagement, motivational aspects, and interpersonal trust (Obermayer-Kovács et al. 2015)46.

Only a few researchers have studied the interactions among different interpersonal factors to explain knowledge sharing (Mooradian et al. 2006). Our study is among the few which explains the psychological process of knowledge sharing through mediation by motivation.

## 2. Literature Review

### 2.1 Knowledge Sharing

Knowledge Sharing can be defined as “the provision or receipt of task information, know-how and feedback regarding a product or procedure” (Cummings, 2004), which is an impression of a socially interactive culture comprising the exchange of knowledge, experiences, skills, abilities and values within or between organizations. Knowledge sharing is a “two-way process” involving both the demand and supply of the knowledge created (Ardichvill et al. 2003)2.

Promoting the conception and sharing of new knowledge is vital for the development of any organization (Nonaka and Takeuchi, 1995)44. Knowledge is a vital resource necessary to attain sustainable competitive advantage in a knowledge based organization through a process in which employees would be stimulated to develop new knowledge and apply it in the most productive manner. (Davenport & Prusak, 1998)14.

At individual level, knowledge sharing has its roots in the social exchange theory, where the employees, through a series of social interaction, would bring more efficiency in the behaviors crucial for success at job (Lin, 2007). Knowledge sharing, at organizational level, is about the formulation, coordination and organization, capturing, reusing and relocating the experience-based knowledge, which is present within the organization, to the needful centers within or outside the organization, making the knowledge available to others and generating new knowledge based on the existing one.

Knowledge sharing helps an organization retain the intellectual capital, even after the employee has left the organization, thereby increasing the profitability and productivity of the organization, ultimately leading to value addition and sustainability (Lin, 2007).

### 2.2 Personality and knowledge sharing

Personality is defined as the “individual differences in characteristic patterns of thinking, feeling and behaving” (APA). Personality, being a cross-situational and highly stable attrib-

ute, has been known to explain the variation in a diversity of human actions, choices and behaviors (Landers & Lounsbury, 2006). There are various dimensions of personality which could be explained through several theories. The Five-Factor Model (FFM) best explains the variability in personality traits, making it the most comprehensive and widely used measure of personality (Zhang & Huang, 2001)63. Lewis Goldberg proposed the FFM comprising of five dimensions of personality, nicknamed the “Big Five” comprising of “openness to experience, extraversion, conscientiousness, agreeableness and emotional stability” (Goldberg, 1990)26.

Few empirical researches have been undertaken on studying the relation between personality type and knowledge sharing. Agyemang et al. (2016)1 found all five traits except conscientiousness to be significantly promoting knowledge sharing among instructors. Chong et al. (2014)9 found extraversion and conscientiousness to be the predictors of knowledge sharing behaviors in classrooms. Cabrera et al. (2006) found agreeableness, openness, and conscientiousness to significantly explain the ‘intention to share knowledge’. Mooradian & Matzler (2006) found agreeableness to effect knowledge sharing by increasing trust among coworkers.

### 2.3 Extrinsic and Intrinsic Motivation and Knowledge Sharing

Motivation has been defined as “an internal state ...giving rise to a desire or pressure to act” (Westwood, 1992)61. Given the prominence of the interpersonal factors in explaining knowledge sharing, the dearth of intrinsic and extrinsic motivation among employees is found to be related to the failure of the knowledge sharing initiatives taken by the management (Osterloh & Frey, 2000). Osterloh and Frey (2000)48 found extrinsic and intrinsic motivations to be central in promoting knowledge sharing behaviors of employees. From the viewpoint of knowledge sharing, extrinsic motivation focuses on the reasons justifying the achievement of goals in terms of benefits or rewards received from sharing a particular knowledge set (Deci & Ryan, 1985)15, while intrinsic motivation focuses on the inherent gratification and satisfaction derived from sharing a unique knowledge (Deci, 1975)16. Both extrinsic and intrinsic motivations have been known to have a affirmative impact on knowledge sharing on workplace (Chen & Hsieh 2015)8.

### 2.4 Personality and motivation

Work psychology suggests that individual differences (or personality) influence individual motivation through interaction with organizational and situational factors (Furnham, 2002)21. O’Reilly et al. (1980)45 suggested that employees perceive their jobs in a significantly different manner, even if the tasks required

to be performed at the job, and the job description remain constant, thereby suggesting a possibility of individual variance in the work behaviors, attitudes and motivations. A ‘meta-analysis’ conducted by Judge and Illies (2002)<sup>33</sup> found a strong influence of “Big Five” on different perspectives of motivation: expectancy, goal setting and self-efficacy motivation. Staw et al. (1986)<sup>56</sup> contended that the differences in employees’ disposition influence their perception about the work environment, making them prioritize their motivations. Furnham (1997)<sup>20</sup> suggested that intrinsic motivation factors affect extraverts more than the introverts. Individuals high in openness were found to be more satisfied with jobs which are less monotonous, which allow them to implement innovative skills and produced them the opportunity to learn new techniques (Furnham et al., 2005)<sup>23</sup>. More recently, Furnham et al. (2009)<sup>22</sup> and Guillén & Saris (2013)<sup>28</sup> found a strong association between personality and motivation. However, most of the empirical results showing the relation between personality and motivation have been inconsistent (Gellatly, 1996)<sup>25</sup>.

### 3. Hypotheses

Based on the theoretical and empirical evidences presented above, we propose the following hypotheses:

#### 3.1 Extrinsic Motivation as a Mediator

H0a: ‘Extrinsic motivation’ will not mediate the relation between ‘personality traits’ and ‘knowledge sharing’.

H1: ‘Extrinsic motivation’ will mediate the relation between ‘personality traits’ and ‘knowledge sharing’.

#### 3.2 Intrinsic motivation as a mediator

H0b: ‘Intrinsic Motivation’ will not mediate the relation between ‘personality traits’ and ‘knowledge sharing’.

H2: ‘Intrinsic Motivation’ will mediate the relation between ‘personality traits’ and ‘knowledge sharing’.

## 4. Research Method

### 4.1 Sample and Data Collection

As our research intends to analyze the factors responsible for knowledge sharing, it was only logical to gather data from a population where knowledge sharing among employees is a significant factor for the success of the team performance and hence for the overall success of the organization. For this reason companies from information and communication technology (ICT) based industry and financial institutions located in Delhi and Delhi-NCR regions were chosen for data collection, which

are often classified as knowledge-based industries. Data was collected using survey method from middle-to-top level employees from these companies who were part of teams working on projects. Our study involves constructs with reflective models only. Out of 600 questionnaires distributed, 450 valid questionnaires were returned. Entire data collection process took around 180 days. The descriptive profile of data collected is given in Table 1.

**Table 1.** (Demographic profile)

Demographic Characteristic	No. of responses	Percentage	
Gender	Male	264	58.67
	Female	186	41.33
Age	Upto 30 years	261	58
	30-40 years	140	31.11
	Over 40 years	49	10.89
Experience	0-5 years	170	37.78
	5-10 years	207	46
Education	Over 10 years	73	16.22
	Undergraduate	193	42.89
Industry	Post-graduate	257	57.11
	ICT	181	40.22
	Financial	269	59.78

### 4.2 Instrumentation

In our study, the scales used to measure the variables were adapted from previous studies. All constructs have multiple sub-dimensions. Knowledge sharing and interpersonal trust were measured using 5-point Likert-type scale (ranging from 1 = Never to 5 = Always; and 1 = strongly disagree to 5 = strongly agree respectively). Rest of the constructs were measured using a 7-point Likert-type scale (ranging from 1 = strongly disagree to 7 = strongly agree).

Expected organizational rewards (a sub-construct of extrinsic motivation), defined as the intensity to which employees perceive about attaining extrinsic incentives such as monetary benefits, job security etc. if they share knowledge, was measured using four items scale derived from Davenport and Prusak (1998), which was validated by Lin (2007). Reciprocal benefits (a sub-construct of extrinsic motivation), which is the intensity of employees’ believes that they would be reciprocated for sharing knowledge, were measured using four item scale adapted from Kankanhalli et al. (2005)<sup>34</sup>, which has been validated by Lin (2007). Knowledge self-efficacy (a sub-construct of intrinsic motivation), which assesses the confidence of employees regarding the value of their knowledge to the organization, was measured using four-item scale constructed by Spreitzer (1995)<sup>55</sup>. Enjoyment in helping

others, which assesses the perception of gratitude obtained by the employee through sharing knowledge, was measured using four items scale derived from Wasko and Faraj (2000)<sup>59</sup>, which was validated by Lin (2007). Big-5 traits (explained earlier) were measured using Ten-Item Personality Inventory-(TIPI) constructed by Gosling et al. (2003). Trust in management and peers were measured using 6 items “Interpersonal Trust at Work Scale” developed by Cook and Wall (1980)<sup>10</sup>, which has been validated by Mooradian et al. (2006)<sup>42</sup>. Finally, knowledge sharing was measured using 28-item knowledge sharing behavior (KSB) scale developed by Yi (2009). The four dimensions of KSB measure written contributions (5-items), organizational communications (8-items), personal interactions (8-items), and communities of practice (7-items).

## 5. Data Analysis and Results

The relationships between the variables were assessed using structural equation modeling through partial least squares (PLS) approach. All the analyses in our study were conducted using SmartPLS 2.0.M3 (Ringle et al. 2005)<sup>52</sup>. According to Hulland (1999)<sup>30</sup>, assessment and interpretation of a PLS model is a two-step process. In the first step, reliability and validity analysis is conducted for the measurement model. In the second step, the predictability and significance of the paths between constructs in the structural model is evaluated.

## 6. Evaluation of the SEM model Requires Following Steps

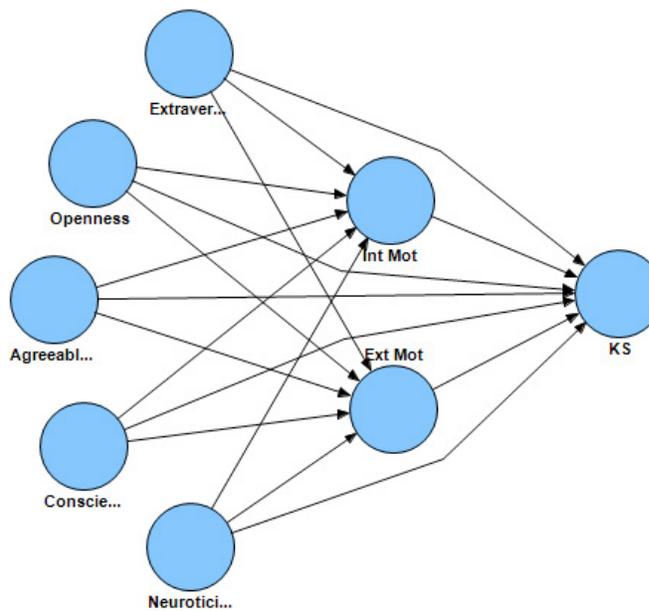
Initially the Reflective models is analyzed wherein, internal consistency is calculated first, followed by calculating the reliability of the indicators proposed in the model, followed by testing for the convergent validity (AVE) and lastly testing the discriminant validity.

After the analysis of the reflective mode, we analyze the structural model on the basis relevance and significance of the relations between the variables. First, structural model is analyzed for any issues arising out of collinearity. Then relevance and significance of the relationships proposed in the structural model are analyzed. After this, R<sup>2</sup> (or coefficient of determination) and Q<sup>2</sup> (or predictive relevance) are calculated, followed by f<sup>2</sup> effect sizes, q<sup>2</sup> effect sizes and finally the Importance-Performance Matrix Analysis (IPMA).

Cronbach (1951)<sup>12</sup> devised a statistical method which divided the data in every possible 2 ways and relies on the average of the correlations of all such potential pairs. Such average is called Cronbach's alpha,  $\alpha$ , which is considered to be a good measure of the reliability of the scale concerned.

Cronbach's  $\alpha$  is:

$$\alpha = \frac{N^2 \overline{Cov}}{\sum s_{item}^2 + \sum Cov_{item}}$$



**Figure 1.** Internal consistency (composite reliability) and indicator reliability.

Following are the results of the Cronbach's  $\alpha$  calculated for every scale, and sub-scale wherever applicable.

Both “Corrected Item-Total Correlation” and “Cronbach's Alpha if Item is Deleted” are a criteria to test indicator reliability.

The “Corrected Item-Total Correlation” column shows between-item correlation and the aggregate score from the construct. A reliable scale shows good correlation of all the items with the total score. We need to identify the items which do not significantly correlate with the score of overall scale. Hence, if the correlation value of any such items is less than 0.3, then that item is considered to be problematic and needs to be reassessed. Such problematic items may need to be removed. For all our data, the item specific correlation with overall score is greater than 0.3, hence none of the items are considered to be problematic.

The items in the column labeled “Cronbach's Alpha if Item is Deleted” shows the value of overall Cronbach's Alpha if that particular item is not included in the computation. If an item is found to have Cronbach's Alpha value which is substantially larger than overall Cronbach's Alpha may need to be removed as it may impact the reliability of the overall scale. However, no such need was felt.

Finally, the value of Cronbach's  $\alpha$  shows the reliability of the overall scale. According to Kline (1999), value of Cronbach's alpha of 0.8 or greater is considered to be acceptable for psy-

**Table 2.** Scale: extraversion

Scale: Extraversion		
Reliability Statistics		
Cronbach's Alpha	0.941	
Item-Specific Statistics		
	Item-Specific Correlation	Cronbach's $\alpha$ upon item Removed
C1	0.956	-
C6	0.956	-
Scale: Openness		
Reliability Statistics		
Cronbach's Alpha	0.785	
Item-Specific Statistics		
	Item-Specific Correlation	Cronbach's $\alpha$ upon item Removed
C5	0.65	-
C10	0.65	-
Scale: Agreeableness		
Reliability Statistics		
Cronbach's Alpha	0.949	
Item-Specific Statistics		
	Item-Specific Correlation	Cronbach's $\alpha$ upon item Removed
C2	0.951	-
C7	0.951	-
Scale: Conscientiousness		
Reliability Statistics		
Cronbach's Alpha	0.96	
Item-Specific Statistics		
	Item-Specific Correlation	Cronbach's $\alpha$ upon item Removed
C3	0.958	-
C8	0.958	-
Scale: Neuroticism		
Reliability Statistics		
Cronbach's Alpha	0.926	
Item-Specific Statistics		
	Item-Specific Correlation	Cronbach's $\alpha$ upon item Removed
C4	0.936	-
C9	0.936	-
Scale: Self Efficacy		
Reliability Statistics		

<b>Cronbach's Alpha</b>	<b>0.798</b>	
<b>Item-Specific Statistics</b>		
	<b>Item-Specific Correlation</b>	<b>Cronbach's <math>\alpha</math> upon item Removed</b>
F5	0.699	0.707
F6	0.645	0.73
F7	0.61	0.752
F8	0.523	0.787
<b>Scale: Altruism</b>		

<b>Reliability Statistics</b>		
<b>Cronbach's Alpha</b>	<b>0.81</b>	
<b>Item-Specific Statistics</b>		
	<b>Item-Specific Correlation</b>	<b>Cronbach's <math>\alpha</math> upon item Removed</b>
F9	0.767	0.715
F10	0.675	0.745
F11	0.592	0.782
F12	0.585	0.784
<b>Scale: Expected Organizational rewards</b>		

<b>Reliability Statistics</b>		
<b>Cronbach's Alpha</b>	<b>0.744</b>	
<b>Item-Specific Statistics</b>		
	<b>Item-Specific Correlation</b>	<b>Cronbach's <math>\alpha</math> upon item Removed</b>
F1	0.684	0.593
F2	0.635	0.626
F3	0.399	0.753
F4	0.47	0.723
<b>Scale: Reciprocal benefits</b>		

<b>Reliability Statistics</b>		
<b>Cronbach's Alpha</b>	<b>0.809</b>	
<b>Item-Specific Statistics</b>		
	<b>Item-Specific Correlation</b>	<b>Cronbach's <math>\alpha</math> upon item Removed</b>
F13	0.689	0.728
F14	0.688	0.731
F15	0.484	0.82
F16	0.652	0.747
<b>Scale: Written Communication</b>		

<b>Reliability Statistics</b>		
<b>Cronbach's Alpha</b>	<b>0.882</b>	
<b>Item-Specific Statistics</b>		

	Item-Specific Correlation	Cronbach's $\alpha$ upon item Removed
A1	0.729	0.855
A2	0.761	0.852
A3	0.783	0.841
A4	0.705	0.86
A5	0.643	0.873

**Scale: Organizational Communication**

Reliability Statistics

Cronbach's Alpha **0.905**

Item-Specific Statistics

	Item-Specific Correlation	Cronbach's $\alpha$ upon item Removed
A6	0.724	0.891
A7	0.696	0.893
A8	0.666	0.896
A9	0.762	0.889
A10	0.804	0.884
A11	0.748	0.888
A12	0.664	0.896
A13	0.552	0.905

**Scale: Personal Interactions**

Reliability Statistics

Cronbach's Alpha **0.913**

Item-Specific Statistics

	Item-Specific Correlation	Cronbach's $\alpha$ upon item Removed
A14	0.763	0.898
A15	0.761	0.898
A16	0.627	0.909
A17	0.66	0.906
A18	0.716	0.901
A19	0.735	0.9
A20	0.752	0.898
A21	0.719	0.901

**Scale: Communities of Practice**

Reliability Statistics

Cronbach's Alpha **0.898**

Item-Specific Statistics

	Item-Specific Correlation	Cronbach's $\alpha$ upon item Removed
A22	0.772	0.874
A23	0.762	0.877

A24	0.681	0.885
A25	0.71	0.882
A26	0.664	0.887
A27	0.758	0.878
A28	0.593	0.894

chological tests such as Intelligence tests, however in the tests measuring the abilities, the value of greater than 0.7 is acceptable.

## 7. Convergent Validity (Average Variance Extracted)

Convergent validity shows the magnitude to which a measure positively correlates with substitute measures of the same construct. In order to determine the convergent validity for a construct, Average variance extracted (AVE) is used.

The results of AVEs for different constructs and sub-constructs used in our model are presented in Table 3.

**Table 3.** Constructs

Variables	AVE
Extraversion	0.9779
Openness	0.8187
Agreeableness	0.9754
Conscientiousness	0.9789
Neuroticism	0.9682
Self-Efficacy	0.6238
Altruism	0.6519
Organizational rewards	0.5568
Reciprocal Benefits	0.6358
Written contribution	0.6858
Organizational comm.	0.6075
Personal interaction	0.6231
Communities of practice	0.624

As all of our constructs have AVEs > 0.5, we can say that such constructs and hence entire model meets the convergent validity requirement.

## 8. Discriminant Validity

Discriminant validity shows the uniqueness of a construct in comparison with other constructs on the basis experiential criteria. If discriminant validity for a construct is proven, that would mean that the construct is exclusive in the study concerned and

measures the aspects not displayed by other variables in the model. Discriminant validity is widely evaluated using “Fornell-Larcker criterion” (Fornell and Larcker, 1981)<sup>19</sup>. “Fornell-Larcker criterion” relates the square root of each variable’s AVE, whereby in order to established discriminant validity, it must be higher when compared to the maximum correlation with any other variable. This would imply that the variable under study would derive more variation with its accompanying indicators than with other variables.

The square roots of the reflective variables’ Average Variance Extracted are on the diagonal and the correlations among the variables in the lower left portion. For example, the reflective construct ‘KS’ has a value of 0.579 for the square root of its AVE, which needs to be compared with all correlation values in the row as well as the column of ‘KS’. Accordingly, all of our constructs meet Fornell-Larcker criterion requirements and discriminant validity is established.

## 9. Assessment of Structural Model for Collinearity Issues

If a large correlations are found among different variables studied in a structural model, that would mean that more than one variable is explaining the same phenomenon, hence such high correlation is not desired. “Tolerance” is used in order to compute the “collinearity” among the variables. “Tolerance” basically computes the extent of variance of one variable which is not explained by another variable. “Variance inflation factor or simply VIF is used to calculate the collinearity, which is the inverse of the “tolerance”.

The VIF is extracted from the square root of the VIF being the extent to which the “standard error” has been augmented due to the occurrence of collinearity. IBM SPSS Statistics software package. The tolerance and VIF are both provided in the regression analysis output of IBM SPSS Statistics software package. When it comes to the SEM using partial least square technique, a tolerance value of lesser or equal to 0.20 and a VIF value of greater or equal to 5 suggests a collinearity problem (Hair, Ringle, & Sarstedt, 2013). These values would suggest that an 80% or more variance in the indicator of the variable being studied is explained the remainder of the formative indicators related to the same variables.

**Table 4.** Shows the application of Fornell-Larcker criterion on our model

Fornell-Larcker Criterion								
	Agree.	Consc	Ext.M	Extrav	Int.M	KS	Neuro	Openn
Agree.	0.988							
Consc.	0.026	0.989						
Ext. M.	0.076	0.593	0.629					
Extrav.	0.009	0.003	0.005	0.989				
Int. M.	-0.022	0.701	0.385	0.053	0.710			
KS	0.339	0.541	0.390	0.271	0.512	0.579		
Neuro.	0.009	0.009	-0.028	-0.004	0.037	0.289	0.984	
Openn.	0.037	-0.037	0.024	0.278	-0.02	0.107	0.020	0.905

We treat the values of tolerance which are greater than 0.2 or a VIF value of over 5.00 of a predictor variable to be suggestive of collinearity. If the values of VIF or tolerance suggest any collinearity issues, then the issue is addressed by either removing the problematic variables, or amalgamating the predictors into a single variable.

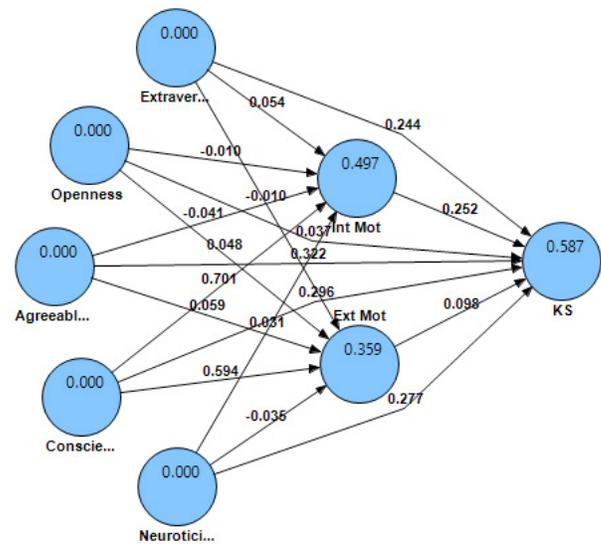
**Table 5.** Collinearity Assesment

Collinearity Assesment			
First set (to Intrinsic & extrinsic motivation)		Second set (to KS)	
Const.	VIF	Const.	VIF
Agree.	1.28	Agree.	1.008
Consc.	1.152	Consc.	1.038
Extrav.	1.086	Extrav.	1.275
Neuro.	1.001	Neuro.	1.204
Openn.	1.09	Openn.	1.09
		Ext. M.	1.206
		Int. M.	1.213

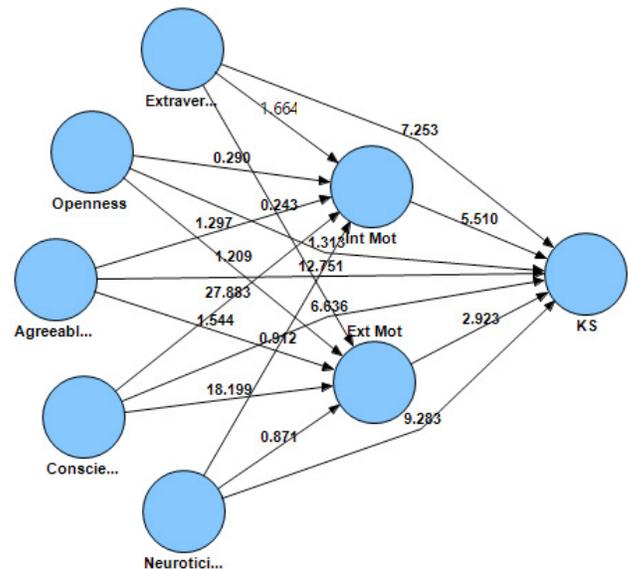
In our model, none of the constructs show collinearity problem.

### 10. Valuation of the Relevance and Significance of the SEM Relationships

Using partial least square algorithm of SEM, path coefficients, or the approximations are generated for the relationships proposed in the structural model. The values of such path coefficients vary between +1 and -1. As the value approaches closer to +1, it signifies a significantly (most of the times) positive relationships between two variables observed. Vice-versa is true for negative values approaching -1. Weak relationships are usually associated with values closer to zero, which are in almost the cases, non-significant. The actual decision regarding the significance of the path coefficient is contingent upon its standard error which is generated using “bootstrapping”. Standard error values obtained using bootstrapping permits evaluating the empirical t value.



**Figure 2.** SEM Relationship.



**Figure 3.** Algorithm of SEM.

If the t value is greater than the threshold value, we can conclude that at certain probable error, the path coefficient is significant. Generally used threshold values for two tailed tests are 1.65 which reflects a level of significance at 10%, 1.96 which reflects a level of significance at 5%, and 2.57 which reflects a level of significance at 1%.

Fig- 2 shows the relevance of relationships of structural model, while Fig-3 shows the significance of such relationships by displaying the respective t values.

**Table 6.** Significance testing results of the structural model path coefficients

Significance testing results of the structural model path coefficients			
	Path Coefficients	t values	Sig. Levels
Agreeableness -> Ext Mot	0.0595	1.6149	*
Agreeableness -> Int Mot	-0.0407	1.3204	NS
Agreeableness -> KS	0.3223	11.7577	***
Conscientiousness -> Ext Mot	0.5942	19.6976	***
Conscientiousness -> Int Mot	0.7013	28.2827	***
Conscientiousness -> KS	0.2959	6.3477	***
Ext Mot -> KS	0.0985	3.048	***
Extraversion -> Ext Mot	-0.0102	0.2587	NS
Extraversion -> Int Mot	0.0542	1.7047	*
Extraversion -> KS	0.2443	6.6938	***
Int Mot -> KS	0.2518	5.4604	***
Neuroticism -> Ext Mot	-0.0355	0.8623	NS
Neuroticism -> Int Mot	0.0306	0.9335	NS
Neuroticism -> KS	0.2773	8.5806	***
Openness -> Ext Mot	0.0476	1.1688	NS
Openness -> Int Mot	-0.0103	0.3056	NS
Openness -> KS	0.0374	1.2752	NS
Agreeableness -> Ext Mot	0.0595	1.5149	NS

Note: NS= not significant  
\*\*p<0.05, \*\*\*p<0.01

After examining the significance of relationships, it is important to assess the relevance of significant relationships. Many studies do not undertake this important step in their analyses but simply focus on the importance of effects. However, the path coefficients in the structural model may be significant, but their size may be so small that they do not warrant managerial attention.

An examination of the comparative significance of associations is important for understanding the results and deriving conclusions.

**Table 7.** Path coefficients (relative importance)

	Path coefficients (relative importance)		
	Ext Mot	Int Mot	KS
Agreeableness	0.0595	-0.0407	0.3223
Conscientiousness	0.5942	0.7013	0.2959
Ext Mot			0.0985
Extraversion	-0.0102	0.0542	0.2443
Int Mot			0.2518
Neuroticism	-0.0355	0.0308	0.2773
Openness	0.0456	-0.0103	0.0374

Results displayed in Table 7 shows that even though extrinsic motivation is significantly explained by Conscientiousness, weightage of Agreeableness is little enough not to warrant much managerial attention. Intrinsic motivation is significantly explained by conscientiousness and extraversion. Knowledge sharing is significantly explained both extrinsic and intrinsic motivation, however weightage of intrinsic motivation is much higher. All personality facets except openness to experience seem to explain KS significantly.

## 11. Examining the Total Effects

In a complex structural model like ours, an endogenous construct may be explained by several constructs indirectly. Hence, to get a complete understanding of the structural model, it is important to know the relevance and significance of the relationships between difference exogenous constructs and endogenous constructs, which is explained by the Total Effect of a particular exogenous construct on target endogenous construct. Total Effect is the aggregate of the “direct effect” and all “indirect effects” linking two constructs. PLS uses the bootstrapping methodology (Efron & Tibshirani, 1986)<sup>17</sup> in order to assess the standard errors, which evaluates the significance of the structural coefficients.

Table 8 displays the Total Effects and their significance (at 5% level) for each exogenous construct on each endogenous construct.

**Table 8.** Significance testing results of the total effects

Significance testing results of the total effects			
	Path Coefficients	t values	Sig. Levels
Agreeableness -> Ext Mot	0.060	1.515	NS
Agreeableness -> Int Mot	-0.041	1.274	NS
Agreeableness -> KS	0.168	6.298	***
Conscientiousness -> Ext Mot	0.594	18.900	***
Conscientiousness -> Int Mot	0.701	28.596	***
Conscientiousness -> KS	0.525	21.539	***
EI -> Ext Mot	0.001	0.446	NS
EI -> Int Mot	0.002	0.560	NS
EI -> KS	0.275	7.608	***
Ext Mot -> KS	0.127	4.188	***
Extraversion -> Ext Mot	-0.010	0.248	NS
Extraversion -> Int Mot	0.054	1.632	NS
Extraversion -> KS	0.127	4.692	***
Int Mot -> KS	0.320	8.732	***
Neuroticism -> Ext Mot	-0.035	0.880	NS
Neuroticism -> Int Mot	0.031	0.964	NS
Neuroticism -> KS	0.205	7.164	***
Openness -> Ext Mot	0.047	1.196	NS
Openness -> Int Mot	-0.011	0.309	NS
Openness -> KS	-0.001	0.044	NS

Note: NS= not significant  
 \*\*p<0.05, \*\*\*p<0.01

**Table 9.** Total effects

	Total effects		
	Ext Mot	Int Mot	KS
Agreeableness	0.0595	-0.0406	0.1675
Conscientiousness	0.594	0.7014	0.5246
Ext Mot			0.1274
Extraversion	-0.0099	0.0542	0.1265
Int Mot			0.3195
Neuroticism	-0.0352	0.031	0.2047
Openness	0.047	-0.0109	-0.0011

The results from Table 8 and 9 shows that Extrinsic and Intrinsic Motivation are significantly explained by Conscientiousness. Knowledge Sharing is significantly explained by Extrinsic and Intrinsic Motivation, however the weightage of

Intrinsic Motivation is much higher. Knowledge Sharing is also indirectly significantly explained by all personality types except Openness to Experience, and the weightage of Conscientiousness is the highest.

Coefficients of determination ( $R^2$ ) results, representing the “exogenous latent variables” collective impact on the “endogenous latent variable”, are presented in Table-10.  $R^2$  is a measure which suggests the predictability of the constructs involved in a model. It is calculated as the squared correlation among the definite values and the projected values of a particular endogenous construct.

**Table 10.** Predictive Relevance

Constructs	R Square
Ext Mot	0.359
Int Mot	0.497
KS	0.587

**Predictive Relevance: Q2**

Stone-Geisser’s Q2 value (Geisser, 1974; Stone, 1974) is an additional tool other than  $R^2$  values, which can be used to measure the predictive accuracy of a construct. In other words, when PLS-SEM displays predictive relevance, it precisely foretells the data points of indicators in “reflective measurement models” of endogenous constructs and endogenous constructs. Q2 values which are greater than zero in any structural model, for a particular reflective endogenous latent variable specify the path model’s predictive relevance for this specific construct. Blindfolding technique is used in order to calculate Q2 value. Blindfolding technique is a procedure which reuses the sample while eliminating every dth data point in the endogenous construct’s indicators and predicts the parameters with the data points which remains (Chin, 1998; Henseler et al., 2009; Tenenhaus et al., 2005). The data points which are removed in this technique, are considered to be missing and dealt with consequently by the SEM algorithm of partial least square (e.g., by means of “mean value replacement”). Omitted data points are then predicted using the subsequent estimates. Q2 measure is calculates using the difference between the true (i.e., omitted) data points and the predicted ones. Blindfolding technique runs the process continuously which repeats till omission of each data point is done and re-estimation of model is done. Q2 values which are greater than zero imply that for a certain endogenous construct, the model has “predictive relevance”. Contrarily, the values lesser than or equal to zero represent an absence of “predictive relevance”.

All values in Table 8 are considerably above 0, thus providing support for our model’s predictive relevance regarding endogenous variables.

$f^2$  effect sizes

**Table 11.** Results of Q2 values

Results of Q <sup>2</sup> values	
Endogenous latent variables	Q <sup>2</sup>
Ext Mot	0.3607
Int Mot	0.4982
KS	0.5999

In order to examine the effect and significance of an exogenous variable on an endogenous variable, variations in the R2 value are analyzed after eliminating the particular exogenous variable. This technique is called f2 effect size. The effect size can be calculated as

$$f^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}}$$

In this formula, “R2 included” and “R2 excluded” values represent R2 values of the endogenous construct when the particular exogenous construct is incorporated in or omitted from the model. The variation in the R2 values is examined by assessing the PLS path model twice. Initially the PLS path model is computed with exogenous construct included in the model, which results in R2 included value and after that exogenous construct is removed from the model which results in R2 excluded value. According to Cohen, (1988) a value of f2 of 0.02 reflects a small effect, which a value of 0.15 reflects a medium and a value of 0.35 represents a large effect of the exogenous construct on the endogenous construct under study.

q2 effect size is a technique used to evaluate comparative predictive significance of a predictor variable on an endogenous variable. The evaluation of q2 effect size is similar to the evaluation of Q2. While, Q2 estimates the predictive significance of the SEM model for every endogenous construct, q2 effect size analyses the predictive significance of a certain exogenous variable on an endogenous variable. q2 effect size value of 0.02 reflects a small predictive significance, which a value of 0.15 reflects a medium and a value of 0.35 represents a large predictive significance of the exogenous construct on the endogenous construct under study.

q<sup>2</sup> effect size is calculated using the following formula.

$$q^2 = \frac{Q^2_{included} - Q^2_{excluded}}{1 - Q^2_{included}}$$

Effect size of variable ‘Conscientiousness’ on the endogenous construct- Intrinsic Motivation is large. Effect sizes of constructs ‘Conscientiousness’ and ‘Agreeableness’ on the endogenous construct- Extrinsic Motivation are small and large respectively.

Effect sizes of the variable ‘Intrinsic Motivation’ on the endogenous construct- Knowledge Sharing is large.

**Table 12.** Summary of results First set (to Intrinsic motivation)

Summary of results			
First set (to Intrinsic motivation)			
Constructs	Path coefficients	f <sup>2</sup> effect size	q <sup>2</sup> effect size
Agreeableness	NS	0.000	0.005
Conscientiousness	0.715***	0.885	0.883
Extraversion	NS	0.004	0.014
Neuroticism	NS	0.002	0.008
Openness	NS	0.383	0.009
Second set (to extrinsic motivation)			
Agreeableness	0.074*	0.006	0.014
Conscientiousness	0.604***	0.495	0.500
Extraversion	NS	0.000	0.007
Neuroticism	NS	0.001	0.008
Openness	NS	0.003	0.011
Third set (to KS)			
Ext Mot	0.0985***	0.015	0.037
Int Mot	0.2518***	0.224	0.220
Agreeableness	0.3223***	0.124	0.194
Conscientiousness	0.2959***	0.33	0.503
Extraversion	0.2443***	0.037	0.027
Neuroticism	0.2773***	0.049	0.049
Openness	NS	0.001	-0.037

Note: NS= not significant

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

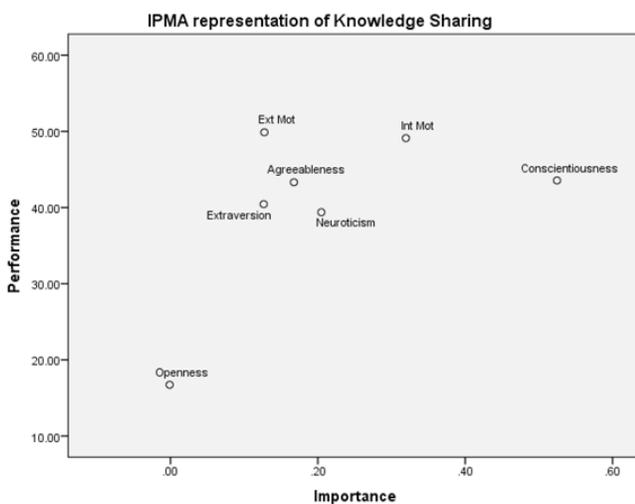
The predictive relevance of Conscientiousness for the construct Intrinsic Motivation is large. Predictive relevance of Agreeableness and Conscientiousness for the construct Extrinsic Motivation is small and large respectively. The predictive relevance of Extrinsic Motivation for the construct Knowledge Sharing is medium, while that of Intrinsic Motivation is large.

## 12. Importance-performance Matrix Analysis

“Importance-performance matrix analysis (IPMA)” is a technique used under PLS-SEM, which, using latent variable scores, compares the “total effects” in a structural model (importance) with the average values of the latent construct scores (performance) for any given dependent variable, thus signifying the aspects which warrant managerial attention (Hair et al. 2013)<sup>29</sup>. Table-13 and Figure 4 shows the result of IPMA analysis.

**Table 13.** Index values and Total Effects for the IPMA of Knowledge Sharing

Index values and Total Effects for the IPMA of Knowledge Sharing		
	Importance (total effects)	Performance
Agreeableness	0.1675	43.3242
Conscientiousness	0.5246	43.5534
Ext Mot	0.1274	49.8808
Extraversion	0.1265	40.446
Int Mot	0.3195	49.116
Neuroticism	0.2047	39.3773
Openness	-0.0011	16.7301



**Figure 4.** (IPMA analysis).

From the IPMA analysis, it is evident that conscientiousness is the most significant construct to facilitate ‘knowledge sharing’, while its performance is comparatively lesser than several others’. Construct extrinsic motivation performs best. Construct Trust is one of the least performing construct while it is one of the most significant ones to facilitate ‘Knowledge Sharing’.

### 13. Mediation Analysis and Hypotheses Testing

Mediation characterizes a situation where a ‘mediator variable’, to a certain degree, engrosses the influence of an exogenous variable on an endogenous variable (Baron & Kenny, 1986)<sup>4</sup>. In our study, we restricted all the mediation analysis between three variables at a time depending on our hypotheses, in order to make comprehension easier. Mediation results are presented in Table 14, for those paths for which the condition of significant direct effect (without mediator) has been met. Such condition was not

met for the direct effects of openness on knowledge sharing without trust and intrinsic motivation as the mediators. Hence, these paths were removed from the mediation analysis.

### 15. Extrinsic Motivation as a Mediator

Extrinsic motivation was found to weakly mediate openness and knowledge sharing (VAF=0.10), and moderately mediate conscientiousness and knowledge sharing (VAF=0.35), partially supporting H1.

### 16. Intrinsic Motivation as a Mediator

Intrinsic motivation was found to weakly mediate extraversion and knowledge sharing (VAF=0.08), while a moderate-to-strong mediation was found between conscientiousness and knowledge sharing (VAF=0.63), partially supporting H2.

### 17. Discussion

Inspired by the necessity to understand the complex relation between prominent interpersonal psychological factors, and their relation with knowledge sharing behaviors of employees, in our study we incorporated Big Five personality traits, intrinsic and extrinsic motivational factors into a structural model, in order to study their indirect and direct effects on knowledge sharing. The results showed the prominence of conscientiousness and emotional stability among Big Five for explaining knowledge sharing behaviors, in lines with Cabrera et al. (2006)<sup>7</sup>. Kim Shin and Swanger (2009)<sup>35</sup> had also found conscientiousness to be one of the most significant personality traits in explaining knowledge sharing. IPMA analysis suggests that even though conscientiousness is the most significant factor in explaining knowledge sharing, its performance is much lower than other interpersonal factors like motivational factors. This has implication for recruitment practices, where the management should attempt to hire more employees rated higher at conscientiousness front, if promotion of knowledge sharing is the aim.

Intrinsic motivation appears to promote more knowledge sharing compared to extrinsic motivation. It is also a stronger mediator for conscientiousness and knowledge sharing. However, it appears that management is a little more focused at extrinsic methods compared to intrinsic methods, to motivate their employees. Management should rather introduce methods such as job enrichment, and value their suggestions (knowledge), which would motivate employees intrinsically, giving them a chance to utilize their unique knowledge set.

**Table 14.** Mediator: Extrinsic Motivation

Mediator: Extrinsic Motivation						
Path	Path coefficient to Ext Mot	Path coefficient of Ext Mot to KS	Total effect	t value	Sig	VAF
Agreeableness> ExtMot>KS	0.10	0.11	0.25	1.84	NS	-
Conscientiousness> ExtMot>KS	0.81	0.11	0.24	4.25	***	0.35
Extraversion> ExtMot>KS	-0.01	0.11	0.25	-0.38	NS	-
Emotional stability> ExtMot>KS	-0.05	0.11	0.24	-1.08	NS	-
Openness> ExtMot>KS	0.14	0.11	0.14	3.22	***	0.10
Mediator: Intrinsic Motivation						
Path	Path coefficient to Int Mot	Path coefficient of Int Mot to KS	Total effect	t value	Sig	VAF
Agreeableness> IntMot>KS	-0.03	0.29	0.24	-0.77	NS	-
Conscientiousness> IntMot>KS	0.96	0.29	0.43	8.47	***	0.63
Extraversion> IntMot>KS	0.07	0.29	0.27	2.01	**	0.08
Emotional stability> IntMot>KS	0.04	0.29	0.25	1.22	NS	-

## 18. Limitations

In our study, Hierarchical Component Model was used for all constructs except for personality traits. In a Hierarchical Component Model, a construct is explained by two or more underlying dimensions, and as our study comprised a large number of constructs, this made it difficult to see the effect of one sub-dimension of a construct on that of another. Doing so could give a better comprehension of the mechanisms through which different factors interact with one another. Future researchers should concentrate on a fewer factors in order to understand such a mechanism. Results concerning the role of personality in explaining knowledge sharing and other interpersonal factors are not perfectly consistent with older studies. However, studies involving personality are known to bring inconsistent results (Zhao & Seibert 2006)<sup>64</sup> In order to keep the questionnaire of a reasonable length, we had adopted a very short scale in order to measure Big Five traits, comprising of only 10-items, as, for even the shortest of other inventories available, number of items exceed over 40 (Facet, B. F. D. Big Five Inventory-BFI). Future researchers may do a more focused study to understand

the detailed interactions of personality traits with other interpersonal factors.

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