CHAPTER NO. 5

DATA ANALYSIS AND DISCUSSION

5.1 Introduction

The previous chapter described the research methodology used to test the theoretical model and the hypothesis developed in Chapter 3. The research methodology covered areas such as – selection of research design, selection of survey method, selection of survey unit, questionnaire design, survey administration and scheme of data analysis. This chapter presents the profile of the respondents and the results of statistical analysis performed on the data collected in this study – importance index, normality assessment of data by obtaining values of Skewness and Kurtosis as pre-requisite to be conducted before steps of SEM are initiated. This was followed by exploratory factor analysis using principal component analysis on seven constructs to extract components and finally confirmatory factor analysis to develop measurement and structural model. The key sections of this chapter are as under:

- o Profile of respondents
- o Analysis of data
- o Findings

5.2 Profile of Respondents

The profile of respondents has been summarized in Table 5.1 and Fig 5.1. As may be seen, out of the total respondents 77% are above the age of 36 years, 62% have experience of more than 9 years in cement marketing & sales and 86% have management qualification.

Although efforts were made to get the survey response from across India but combined response from North and East region was relatively higher compared to South and West. However, it is difficult to attribute any particular reason for this but for better response rate on account of persuasion that yielded higher response from North and East.

The 120 respondents collectively carry out marketing and sales activity across 36 states and union territories in India. These respondents cover 29% of the total districts in India Table 5.2 that could be treated as fair representation of the overall market for the study. The study has covered 35% districts in the northern region which comprises 35% of all India consumption of cement, 26.2% of the districts for east comprising 19% of all India consumption, 15.3% districts from west covering 21% of all India consumption and 30.5% of districts from south covering 24% of all India consumption for the year 2016-17.

Table 5.1 Profile of Respondents

Profile of Respondent's		Respondents	
		Number	Share
Age (in years)			
Under 30 years		4	3%
31-35 years		24	20%
36-40 years		29	24%
40 years and above		63	53%
	Total	120	100%
Educational qualification			
Only Bachelor's degree		16	13%
Bachelor's degree with Master's degree in management		81	68%
Bachelor's degree with diploma in management		23	19%
	Total	120	100%
Years of working experience in current organization			
Less than 3 years		22	18%
More than 3 years and less than 6 years		12	10%
More than 6 years and less than 9 years		12	10%
More than 9 years and less than 12 years		15	13%
More than 12 years		59	49%
	Total	120	100%
Region wise representation			
North		48	40%
East		46	38%
West		11	9%
South		15	13%
	Total	120	100%
Size of market managed by respondent's (in metric ton per month)			
Less than 10000			
Between 10001 and 20000		5	4%
Between 20001 and 30000		9	8%
Between 30001 and 40000		13	11%
Above 40000		10	8%
	Total	83	69%
		120	100%
Respondent's categorized based on capacity (in million ton) of their organization			
≤ 20 [from 4 organizations]			
$> 20 \leq 40$ [from 3 organization)		40	33%
$> 40 \leq 60$ [none]		7	6%
$> 60 \leq 80$ [from 1 organization]		0	0%
	Total	73	61%
		120	100%

Age
- 4, 3%
- 24, 20%
- 63, 53%
- 29, 24%

Under 30 years ■ 31-35 years ■ 36-40 years ■ 40 years and above

Educational Qualification
- 16, 13%
- 23, 19%
- 81, 68%

Only Bachelor's degree
Bachelor's degree with Master's degree in management
Bachelor's degree with diploma in management

Work Experience
- 22, 18%
- 12, 10%
- 12, 10%
- 15, 13%
- 58, 49%

Less than 3 years ■ More than 3 years and less than 6 years
More than 6 years and less than 9 years ■ More than 9 years and less than 12 years
More than 12 years

Region wise representation
- 15, 13%
- 11, 9%
- 48, 40%
- 46, 38%

North ■ East ■ West ■ South

Respondent's categorized based on capacity (million tons) of their organization
- 40, 33%
- 74, 61%
- 7, 6%
- 0, 0%

≤ 20 ■ > 20 ≤ 40 ■ > 40 ≤ 60 ■ > 60 ≤ 80

Size of market managed by respondent's (in metric ton per month)
- 5, 4%
- 9, 8%
- 13, 11%
- 10, 8%
- 83, 69%

Less than 10000 ■ Between 10001 and 20000 ■ Between 20001 and 30000
Between 30001 and 40000 ■ Above 40000

Fig 5.1 Profile of Respondents

Table 5.2 States and Districts of India Covered, and Region-wise Cement Consumption

Region	State	Total Districts (A)	Districts covered (B)	% covered C = (A/B)	Consumption of cement in million tons (2016-17)
North	Chandigarh (UT)	1	1	100	
	Delhi (NCT)	11	11	100	
	Madhya Pradesh	51	26	51	
	Punjab	22	3	14	
	Rajasthan	33	9	27	
	Uttar Pradesh	75	42	56	93 (35%)
	Haryana	22	0	0	
	Himachal Pradesh	12	0	0	
	Jammu and Kashmir	22	0	0	
	Uttarakhand	13	0	0	
	Total (A)	**262**	**92**	**35**	
East	Chhattisgarh	27	11	41	
	Bihar	38	29	76	
	Jharkhand	24	6	25	
	Odisha	30	5	17	
	Sikkim	4	4	100	
	Arunachal Pradesh	21	0	0	
	Assam	33	0	0	50 (19%)
	Manipur	16	0	0	
	Meghalaya	11	0	0	
	Mizoram	8	0	0	
	Nagaland	11	0	0	
	Tripura	8	0	0	
	West Bengal	21	11	52	
	Total (B)	**252**	**66**	**26**	
West	Gujarat	33	4	12	
	Maharashtra	36	7	22	
	Dadra and Nagar Haveli (UT)	1	0	0	55 (21%)
	Daman and Diu (UT)	2	0	0	
	Total (C)	**72**	**11**	**15**	
South	Andhra Pradesh	13	4	31	
	Kerala	14	5	36	
	Telangana	31	31	100	
	Andaman and Nicobar Island(UT)	3	0	0	
	Goa	2	0	0	64 (24%)
	Karnataka	30	0	0	
	Lakshadweep(UT)	1	0	0	
	Puducherry (UT)	4	0	0	
	Tamil Nadu	32	0	0	
	Total (D)	**131**	**40**	**31**	
	Total (A+B+C+D)	**716**	**209**	**29**	**263 (100%)**

Source of districts (A) - http://districts.nic.in (access dated Nov 22, 2017)
Source of cement consumption 2016-17 – Cement sector report September 2017 by Crisil

5.3 Analysis of Data

5.3.1 Importance index analysis

The importance of variables in the questionnaire was undertaken with the help of importance index analysis. The Table 5.3 shows variable classification under 5 categories namely, very important, important, preferred, less important and not important categories. The importance index of indicators was calculated for each variable in the questionnaire based on the formula given below (Digalwar and Sangwan, 2011; Digalwar *et al.*, 2013) based on 120 responses received from the repondents. The indices developed for each variable provide the relative importance of the variables in the listed questionnaire.

$$\text{Importance index of variable X} = X\left(I_x\right) = \left(\frac{\sum_{i=1}^{7} a_i X_i}{7 \sum_{i=1}^{7} X_i}\right) \times 100\%$$

Where:

a_i = Constant expressing weight given to i.

X_i = Variable expressing frequency of response for i

i = 1,2,3,4,5,6,7

The importance index ranges between 0 to 100. The high index value indicates that the variable is important and lower value not important. The indices have been categorized as under:

- Very important: $80 < I \le 100$
- Important: $60 < I \le 80$
- Preferred: $40 < I \le 60$
- Less important: $20 < I \le 40$
- Not important: $0 < I \le 20$

Table 5.3 Importance Index Analysis – Variables Classification

S. No	Construct	Number of items	Very important	Important	Preferred	Less important	Not important
1	KMPRAHR	10	-	9	1	-	-
2	KMPRAIT	10	2	7	1	-	-
3	KMPROAQR	10	7	3	-	-	-
4	KMPROUSE	10	4	6	-	-	-
5	KMPROSHR	10	2	8	-	-	-

Table 5.3 (Contd..)

S. No	Construct	Number of items	Very important	Important	Preferred	Less important	Not important
6	KMPROAPP	10	8	2	-	-	-
7	CA	5	5	-	-	-	-
	Total	**65**	**28**	**35**	**2**	**-**	**-**

According to above categorization out of 65 variables, 28 constituting 43% of total number of variables were found to be very important, 35 constituting 54% of variables were found to be important and 2 remaining constituting 3% of variables were found to be preferred. None of the variables was identified as less important or not important. Thus, it can be inferred that the relative importance of all the variables given by respondents is significantly high. These variables from very important to not important are summarized in Table 5.3.

The categorization of the variables reveals that all the variables should be included in the questionnaire. This also indicates that the respondents have recognized that all the variables are required for the intended purpose.

5.3.2 Normality assessment of data

The normality can be assessed by obtaining the values of Skewness and Kurtosis (Mîndrila, 2010; Pallant, 2016). Skewness occurs when responses are more on one side of the measurement scale and Kurtosis reflects flatness in data distribution. However, there is no consensus regarding an acceptable degree of non-normality, but cut-off absolute values of Skewness and Kurtosis are 2 and 7 respectively to assess normality (Mîndrila, 2010). The absolute values of Skewness are mostly less than 2; however, for a few variables it was around 2. Therefore, all variables pass through the test of Skewness. The Kurtosis values of all the variables were less than 7 which pass through acceptability test Table 5.4. Thus normality of the data had been established to consider all the 65 variables for study and further development of measurement model followed by structural model can be carried out.

Table 5.4 Normality Assessment of Variables

Construct	Variable	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
KMPRAHR	C11A	120	5.25	1.76	-0.98	0.22	-0.04	0.44
	C12A	120	3.83	2.01	0.09	0.22	-1.36	0.44
	C13A	120	4.73	1.6	-0.51	0.22	-0.42	0.44
	C14A	120	5.21	1.63	-1.14	0.22	0.46	0.44
	C15A	120	5.52	1.35	-1.37	0.22	1.67	0.44
	C16A	120	4.94	1.95	-0.81	0.22	-0.64	0.44
	C17A	120	5.17	1.64	-0.83	0.22	-0.27	0.44
	C18A	120	4.78	1.85	-0.52	0.22	-1.06	0.44
	C19A	120	4.87	1.72	-0.73	0.22	-0.52	0.44
	C110A	120	5.33	1.75	-1.05	0.22	0.02	0.44
KMPRAIT	C21A	120	5.73	1.36	-1.69	0.22	2.97	0.44
	C22A	120	4.75	1.84	-0.73	0.22	-0.64	0.44
	C23A	120	5.35	1.76	-1.11	0.22	0.34	0.44
	C24A	120	5.54	1.41	-1.25	0.22	1.54	0.44
	C25A	120	5.75	1.52	-1.73	0.22	2.7	0.44
	C26A	120	5.27	1.43	-1.11	0.22	1.03	0.44
	C27A	120	4.22	1.76	-0.13	0.22	-1.02	0.44
	C28A	120	4.47	1.73	-0.35	0.22	-0.9	0.44
	C29A	120	4.57	1.81	-0.53	0.22	-0.81	0.44
	C210A	120	5.6	1.62	-1.56	0.22	1.8	0.44
KMPROACQ	C31A	120	5.84	1.27	-2.05	0.22	4.91	0.44
	C32A	120	5.89	1.3	-1.76	0.22	3.12	0.44
	C33A	120	5.78	1.09	-1.44	0.22	3.23	0.44
	C34A	120	5.48	1.37	-1.44	0.22	2.03	0.44
	C35A	120	5.73	1.25	-1.48	0.22	2.62	0.44
	C36A	120	5.32	1.52	-1.05	0.22	0.46	0.44
	C37A	120	6.03	1.11	-1.58	0.22	3.62	0.44
	C38A	120	5.5	1.46	-1.42	0.22	1.72	0.44
	C39A	120	5.73	1.3	-1.5	0.22	2.56	0.44
	C310A	120	5.72	1.32	-1.35	0.22	1.53	0.44
KMPROSHR	C41A	120	5.77	1.4	-1.52	0.22	2.1	0.44
	C42A	120	5.65	1.4	-1.41	0.22	1.77	0.44
	C43A	120	5.65	1.28	-1.39	0.22	2.3	0.44
	C44A	120	5.49	1.37	-1.12	0.22	1.12	0.44
	C45A	120	5.52	1.5	-1.41	0.22	1.51	0.44
	C46A	120	5.43	1.52	-1.12	0.22	0.71	0.44
	C47A	120	6.1	1.13	-2.25	0.22	6.92	0.44
	C48A	120	5.1	1.46	-0.96	0.22	0.44	0.44
	C49A	120	5.35	1.34	-1.24	0.22	1.46	0.44
	C410A	120	5.52	1.38	-1.31	0.22	1.42	0.44
KMPROUSE	C51A	120	5.83	1.34	-1.71	0.22	2.98	0.44
	C52A	120	5.19	1.29	-0.6	0.22	-0.22	0.44
	C53A	120	5.57	1.3	-1.31	0.22	2.09	0.44
	C54A	120	5.43	1.21	-1.32	0.22	1.83	0.44
	C55A	120	5.13	1.48	-0.93	0.22	0.6	0.44
	C56A	120	5.57	1.49	-1.56	0.22	2.08	0.44
	C57A	120	5.65	1.39	-1.57	0.22	2.6	0.44
	C58A	120	5.48	1.37	-1.22	0.22	1.36	0.44
	C59A	120	5.35	1.35	-0.83	0.22	0.41	0.44
	C510A	120	5.54	1.35	-1.19	0.22	1.05	0.44

Table 5.4 (Contd..)

Construct	Variable	N	Mean	Std. Deviation	Skewness		Kurtosis	
		Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
KMPROAPP	C61A	120	5.81	1.37	-1.59	0.22	2.3	0.44
	C62A	120	5.56	1.27	-1.48	0.22	2.52	0.44
	C63A	120	5.81	1.22	-1.55	0.22	3.22	0.44
	C64A	120	5.82	1.22	-1.66	0.22	3.3	0.44
	C65A	120	5.55	1.26	-1.34	0.22	2.22	0.44
	C66A	120	5.83	1.21	-1.76	0.22	3.84	0.44
	C67A	120	5.81	1.1	-1.57	0.22	3.89	0.44
	C68A	120	5.87	1.15	-1.41	0.22	2.56	0.44
	C69A	120	5.78	1.27	-1.76	0.22	3.71	0.44
	C610A	120	5.89	1.17	-1.57	0.22	2.97	0.44
CA	C71A	120	5.99	1.41	-1.8	0.22	3.01	0.44
	C72A	120	6.31	1.11	-2.04	0.22	4.88	0.44
	C73A	120	5.98	1.12	-1.3	0.22	1.8	0.44
	C74A	120	6.14	1.15	-2.08	0.22	5.73	0.44
	C75A	120	5.98	1.09	-1.3	0.22	2.07	0.44

5.3.3 Reliability assessment and item analysis

To examine the content validity (Hair 2006, page 620, 7th edition) initially, the questionnaire was developed, discussed and shared with 4 senior and middle management professionals from three functions - sales and marketing, supply chain and IT of cement companies in India.

In order to test reliability of each construct alpha coefficient (Cronbach) and item analysis statistics were calculated. The results indicate that all the 7-constructs have values of alpha coefficient (Cronbach) between 0.835 and 0.937 (Table 5.5), which is above the acceptable value of 0.70 (Hair 2006, page 125, 7th edition). The average inter-item correlation of variables is between 0.21 and 0.69 (Appendix V) that is above acceptable value of 0.20 for a 10-variable construct to achieve Cronbach alpha of 0.71 (Ferketich 1991, Zeller, 1980) and the Item-total correlation values of all the variables (Appendix VI) are above the acceptable limit of 0.30. (SPSS Survival Manual, 6th edition, page no. 257-258). Only for variable C15A, Item-total correlation value is 0.28, marginally less than the acceptable limit of 0.30. This variable C15A was retained, since the alpha coefficient (Cronbach) for the construct KMPRAHR with this variable is 0.876 and removing this variable will not change significantly the alpha coefficient for the construct. The combined results of reliability and item analysis tests indicate that the constructs developed are reliable.

Table 5.5 Alpha Values of the Constructs

S. No	Construct	Cronbach's alpha value
1	KMPRAHR	0.876
2	KMPRAIT	0.899
3	KMPROAQR	0.923
4	KMPROUSE	0.923
5	KMPROSHR	0.906
6	KMPROAPP	0.937
7	CA	0.835

The next step was to conduct factor analysis that was required to determine construct validity of the constructs. In order to apply factor analysis on the constructs, KMO analysis was performed on the constructs to determine the strength of the relationship among the variables of the construct. The KMO value for all the 7-constructs was found to be between 0.740 and 0.885 (Table 5.6), which is above the specified limit of 0.60 (Kaiser & Rice, 1974; Pallant, 2016) for the factor analysis.

Table 5.6 KMO Measures for the Construct

S. No	Construct	KMO
1	KMPRAHR	0.836
2	KMPRAIT	0.873
3	KMPROAQR	0.885
4	KMPROUSE	0.868
5	KMPROSHR	0.875
6	KMPROAPP	0.856
7	CA	0.740

Subsequent to the KMO test, to conduct the factor analysis on the variables under each construct, the principal component analysis with varimax rotation was performed (Appendix VII). It was found that for 3 constructs - KMPROACQ, KMPROAPP and CA, only one component was extracted with an eigenvalue greater than 1, explaining 62.54% of a variable's variance is shared with other variables for construct KMPROACQ, 64.19% for construct KMPROAPP and 61.20% for construct CA, of the total variance in the original sets of variables. And for another 4 constructs – KMPRAHR, KMPRAIT, KMPROSHR and KMPROUSE, more than one component was extracted with an eigenvalue greater than 1, explaining 62.43% for construct KMPRAHR, 66.28% for construct KMPRAIT, 65.08% for construct KMPROSHR and 69.90% for construct KMPROUSE, of the total variance in the original sets of variables. The explained variance for all the constructs with one component and more than one component is greater than 60%. In social sciences, where information is often less

precise, it is not uncommon to consider a solution that accounts for 60% of the total variance (and in some instances even less) as satisfactory (Hair 2006, page 107, 7th edition).

The factor analysis suggests single factor for the 3 constructs - KMPROACQ, KMPROAPP and CA, and two factors of the remaining 4 constructs – KMPRAHR, KMPRAIT, KMPROSHR and KMPROUSE. The Table 5.7 shows the loadings of variables on one or more factors by performing varimax rotation. The factor loadings are above 0.5 for all the variables. However, the variables C26A, C46A, C51A, C57A and C510A were found to have load on more than one factor. These variables are subject to deletion as their relevance is minimal due to cross loading. The variables after factor analysis were studied and considered for confirmatory factor analysis by SEM.

Table 5.7 Varimax Rotated Exploratory Factor Analysis

Construct	Variable	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
KMPRAHR	C11A	0.778										
	C12A	0.783										
	C13A	0.665										
	C14A		0.794									
	C15A		0.634									
	C16A	0.810										
	C17A		0.741									
	C18A	0.838										
	C19A	0.621										
	C110A	0.792										
KMPRAIT	C21A				0.547							
	C22A			0.614								
	C23A				0.751							
	C24A				0.852							
	C25A				0.868							
	C26A			0.598	0.604							
	C27A			0.842								
	C28A			0.836								
	C29A			0.735								
	C210A			0.701								
KMPROACQ	C31A					0.805						
	C32A					0.707						
	C33A					0.726						
	C34A					0.780						
	C35A					0.863						
	C36A					0.844						
	C37A					0.702						
	C38A					0.796						
	C39A					0.872						
	C310A					0.791						

Table 5.7 (Contd..)

Construct	Variable	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
KMPROSHR	C41A						0.681					
	C42A						0.658					
	C43A							0.578				
	C44A						0.854					
	C45A						0.754					
	C46A						0.649	0.541				
	C47A							0.634				
	C48A							0.712				
	C49A							0.753				
	C410A							0.873				
KMPROUSE	C51A								0.583	0.534		
	C52A								0.724			
	C53A								0.572			
	C54A								0.888			
	C55A								0.609			
	C56A								0.769			
	C57A								0.514	0.663		
	C58A									0.914		
	C59A									0.857		
	C510A								0.549	0.637		
KMPROAPP	C61A										0.754	
	C62A										0.787	
	C63A										0.808	
	C64A										0.856	
	C65A										0.750	
	C66A										0.902	
	C67A										0.869	
	C68A										0.764	
	C69A										0.697	
	C610A										0.804	
CA	C71A											0.862
	C72A											0.854
	C73A											0.570
	C74A											0.849
	C75A											0.736

The total of 5 variables C26A, C46A, C52A, C57A and C510A, due to cross loading on two factors; have been dropped from carrying out further analysis. The variable C26A belongs to the category of knowledge management practice and the other 4 to knowledge management process. Finally, the total variables carried forward for confirmatory factor analysis are 60.

5.3.4 Confirmatory factor analysis – Individual and combined constructs

The development of measurement model is one of the first steps before complete structural equation model with specific indicators is analyzed. In this study, initially 7-

constructs were developed comprising of 65 variables, on these EFA was performed using the first half of the data (sample size: 60). The total of 60 variables obtained after EFA were then used to verify the measurement model using the second half of the data (sample size:60). Initially, step 1 -the measurement model using the variables obtained for each construct from EFA is tested for fitness, followed by, step 2- the structural model of the theoretical model is tested for fitness using the variables obtained after each individual construct is tested for fitness and step 3 - finally the overall measurement and structural model is developed and discussed.

To improve the fit level of the measurement model guidelines for good fit were applied. First, the factor loading (also known as standardized regression weights) should be 0.5 or higher and ideally 0.7 or higher (Hair 2006, page 618, 7th edition). Second, the standardized residuals were looked into. Typically, standardized residuals less than |2.5| do not suggest a problem. Conversely, residuals greater than |4.0| raise a red flag and suggest a potentially unacceptable degree of error (Hair 2006, page 621, 7th edition). Third, the modification indices were studied and modification indices of approximately greater than 4.0 suggest that the fit could be improved significantly by freeing the corresponding path to be estimated.

The subsequent section deals with MM for individual constructs.

5.3.4.1 MM for Construct – Knowledge Management Practice pertaining to HR (KMPRAHR)

Knowledge Management practices pertaining to HR is a two-unidimensional construct KMPRAHR measured by two constructs KMPRAHR1 comprising of seven exogenous variables C11A, C12A, C13A, C16A, C18A, C19A and C110A, and KMPRAHR2 comprising of three exogenous variables C14A, C15A and C17A. The confirmatory factor analysis was carried out to confirm the validity of the construct. The preliminary model fit results χ^2 / df = 2.257, CFI = 0.815, GFI = 0.813 indicated that the fitness conditions can be further improved. To improve the fit level of KMPRAHR the measurement model guidelines mentioned in section 5.3.4 for good fit were applied. In the third iteration fit results indicate that the fitness conditions are satisfied. Table 5.8 indicates results of each iteration and Fig 5.2 shows number of variables obtained after final iteration.

Table 5.8 Iterations and Fit Indices for KMPRAHR

Iteration	χ2 / df	GFI	CFI	Variable (nos)	W/O	Variables									
1	2.257	0.813	0.815	10		C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
2	2.405	0.818	0.832	9	C15A	C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
3	1.712	0.873	0.921	8	C11A	C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
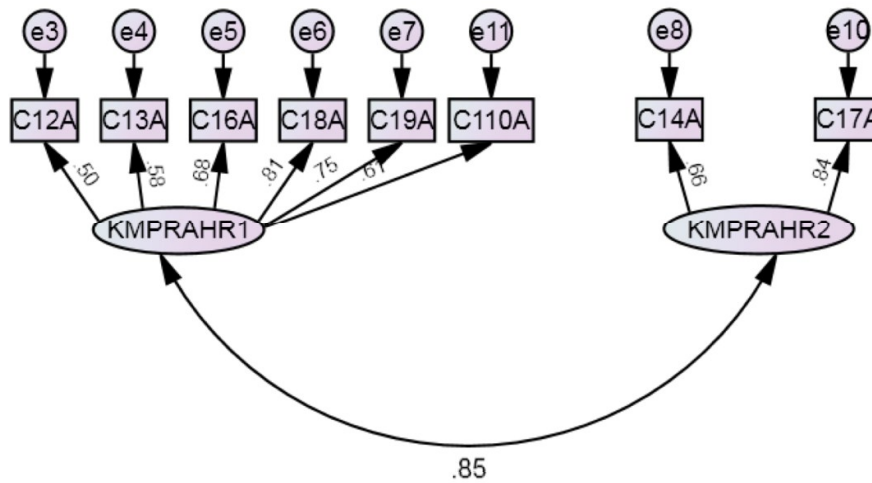
Fig 5.2 CFA Results for KMPRAHR

5.3.4.2 MM for Construct – Knowledge Management Practice pertaining to IT (KMPRAIT)

Knowledge Management practices pertaining to IT is a two-unidimensional construct KMPRAIT measured by two constructs KMPRAIT1 comprising of five exogenous variables C22A, C27A, C28A, C29A and C210A and KMPRAIT2 comprising of four exogenous variables C21A, C23A, C24A and C25A. The variable C26A was deleted after the EFA due to its cross-loading on two factors. The confirmatory factor analysis was carried out to confirm the validity of the construct with nine variables. The preliminary model fit results χ^2 / df = 3.139, CFI = 0.721, GFI = 0.800 indicated that the fitness conditions can be further improved. To improve the fit level of KMPRAIT the measurement model guidelines mentioned above for good fit were applied. In the third iteration fit results indicate that the fitness conditions are satisfied. Table 5.9

indicates results of each iteration and Fig 5.3 shows number of variables obtained after final iteration.

Table 5.9 Iterations and Fit Indices for KMPRAIT

| Iteration	χ2 / df	GFI	CFI	Variable (nos)	W/O	Variables									
1	3.139	0.800	0.721	9	C26A	C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
2	2.839	0.835	0.787	8	C22A	C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
3	1.437	0.915	0.954	7	C21A	C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
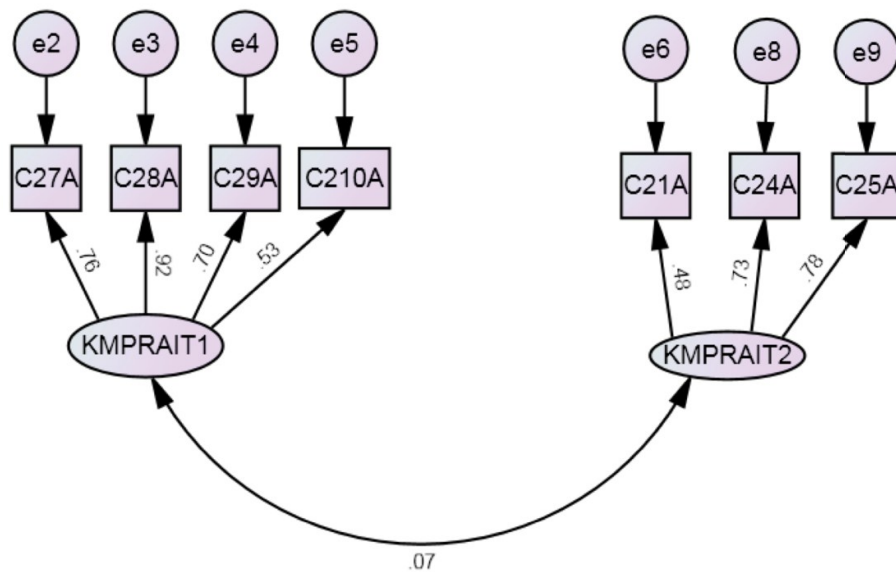
Fig 5.3 CFA results for KMPRAIT

5.3.4.3 MM for construct – Knowledge Management Process to acquire Knowledge (KMPROACQ)

Knowledge Management processes pertaining to acquisition of knowledge is a uni-dimensional construct measured by ten exogenous variables C31A, C32A, C33A, C34A, C35A, C36A, C37A, C38A, C39A and C310A. The confirmatory factor analysis was carried out to confirm the validity of the construct. The preliminary model fit results χ^2 / df = 2.076, CFI =0.778, GFI = 0.804 indicated that in the first iteration fitness conditions are not satisfied and further iterations need to be performed. To improve the fit level of KMPROACQ the measurement model guidelines mentioned in section 5.3.4 for good fit were applied. In the fifth iteration fit results indicate that the

fitness conditions are satisfied. Table 5.10 indicates results of each iteration and Fig 5.4 shows number of variables obtained after final iteration.

Table 5.10 Iterations and Fit Indices for KMPROACQ

| Iteration	$\chi 2 / df$	GFI	CFI	Variable (nos)	W/O	Variables									
1	2.076	0.804	0.778	10		C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
2	1.934	0.834	0.828	9	C37A	C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
3	1.533	0.889	0.914	8	C35A	C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
4	1.929	0.892	0.89	7	C31A	C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
5	1.986	0.916	0.917	6	C33A	C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
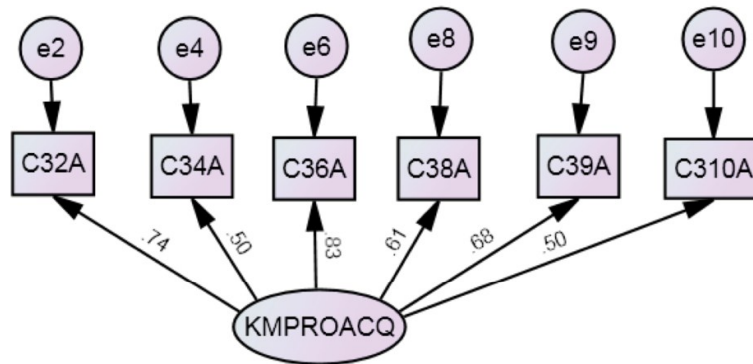
Fig 5.4 CFA results for KMPROACQ

5.3.4.4 MM for construct – Knowledge Management Process to share Knowledge (KMPROSHR)

Knowledge Management processes pertaining to acquisition of knowledge is a two-unidimensional construct KMPROSHR measured by two constructs KMPROSHR1 comprising of seven exogenous variables C41A, C42A, C44A and C45A and KMPROSHR2 comprising of five exogenous variables C43A, C47A, C48A, C49A and C410A. The variable C46A was deleted after the EFA due to its cross-loading on two factors. The confirmatory factor analysis was carried out to confirm the validity of the construct. The preliminary model fit results $\chi^2 / df = 2.076$, CFI $=0.778$, GFI $= 0.804$ indicated that in the first iteration fitness conditions are not satisfied and further iterations need to be performed. To improve the fit level of KMPROSHR, the

measurement model guidelines mentioned in section 5.3.4 for good fit were applied. In the fourth iteration fit results indicate that the fitness conditions have been satisfied. Table 5.11 indicates results of each iteration and Fig 5.5 shows number of variables obtained after final iteration.

Table 5.11 Iterations and Fit Indices for KMPROSHR

Iteration	$\chi 2$ / df	GFI	CFI	Variable (nos)	W/O	Variables									
1	3.234	0.824	0.755	9	C46A	C41A	C42A	C43A	C44A	C45A	C46A	C47A	C48A	C49A	C410A
2	3.920	0.831	0.755	8	C47A	C41A	C42A	C43A	C44A	C45A	C46A	C47A	C48A	C49A	C410A
3	3.504	0.879	0.828	7	C49A	C41A	C42A	C43A	C44A	C45A	C46A	C47A	C48A	C49A	C410A
4	1.691	0.942	0.963	6	C410A	C41A	C42A	C43A	C44A	C45A	C46A	C47A	C48A	C49A	C410A
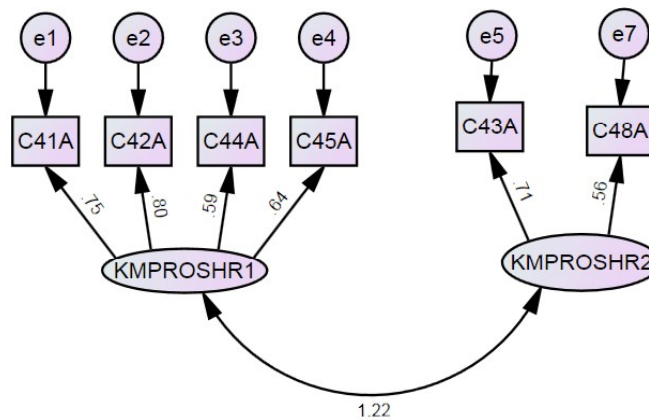
Fig 5.5 CFA results for KMPROSHR

5.3.4.5 MM for construct – Knowledge Management Process to use Knowledge (KMPROUSE)

Knowledge Management processes pertaining to acquisition of knowledge is a two-unidimensional construct KMPROUSE, measured by two constructs KMPROUSE1 comprising of five exogenous variables C52A, C53A, C54A, C55A and C56A and KMPROUSE2 comprising of two exogenous variables C58A and C59A. The variables C51A, C57A and C510A were deleted after the EFA due to their cross-loading on two factors. The confirmatory factor analysis was carried out to confirm the validity of the construct. The preliminary model fit results χ^2 / df = 1.427, CFI = 0.925, GFI = 0.960 indicated that in the first iteration fitness conditions are satisfied and further iterations

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need not be performed. To improve the fit level of KMPROUSE, the measurement model guidelines mentioned in section 5.3.4 for good fit were applied. Table 5.12 indicates results of each iteration and Fig 5.6 shows number of variables obtained after final iteration.

Table 5.12 Iterations and Fit Indices for KMPROUSE

Iteration	$\chi 2$ / df	GFI	CFI	Variable (nos)	W/O	Variables									
1	1.427	0.925	0.960	7		C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
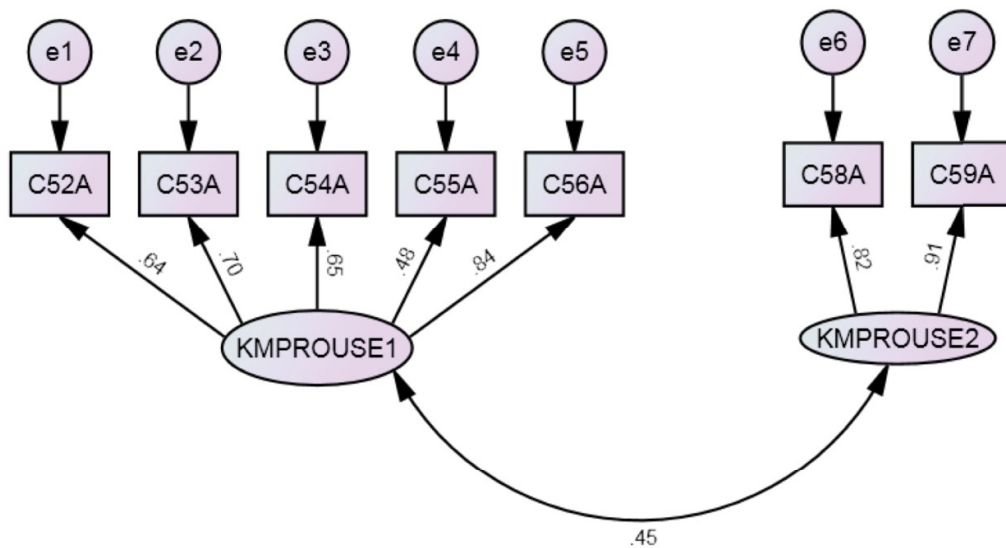
Fig 5.6 CFA results for KMPROUSE

5.3.4.6 MM for construct – Knowledge Management Process to apply Knowledge (KMPROAPP)

Knowledge Management processes pertaining to acquisition of knowledge is a uni-dimensional construct measured by eight exogenous variables C61A, C62A, C63A, C64A, C65A, C66A, C67A and C610A. The confirmatory factor analysis was carried out to confirm the validity of the construct. The preliminary model fit results χ^2 / df = 3.466, CFI = 0.743, GFI = 0.723 indicated that in the first iteration fitness conditions are not satisfied and further iterations need to be performed. To improve the fit level of KMPROAPP, the measurement model guidelines mentioned in section 5.3.4 for good

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fit were applied. In the third iteration fit results indicate that the fitness conditions are satisfied. Table 5.13 indicates results of each iteration and Fig 5.7 shows number of variables obtained after final iteration.

Table 5.13 Iterations and Fit Indices for KMPROAPP

Iteration	$\chi 2$ / df	GFI	CFI	Variable (nos)	W/O	Variables									
1	3.466	0.723	0.743	10		C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
2	2.422	0.821	0.854	9	C69A	C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
3	1.902	0.870	0.917	8	C68A	C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
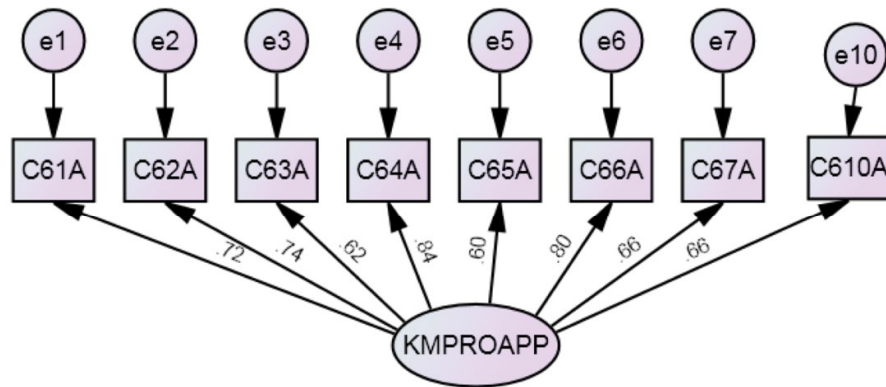
Fig 5.7 CFA Results for KMPROAPP

5.3.4.7 MM for construct – Competitive advantage (CA)

Competitive advantage is a uni-dimensional construct measured by five exogenous variables C71A, C72A, C73A, C74A and C75A. The confirmatory factor analysis was carried out to confirm the validity of the construct. The preliminary model fit results χ^2 / df = 2.147, CFI = 0.936, GFI = 0.936 indicated that in the first iteration itself fitness conditions are satisfied and further iterations need not be performed. To improve the fit level of CA, the measurement model guidelines mentioned in section 5.3.4 for good fit were applied. Table 5.14 indicates results of each iteration and Fig 5.8 shows number of variables obtained after final iteration.

Table 5.14 Iterations and Fit Indices for CA

| Iteration	χ2 / df	GFI	CFI	Variable (nos)	W/O	Variables								
1	2.147	0.939	0.936	5		C71A	C72A	C73A	C74A	C75A				
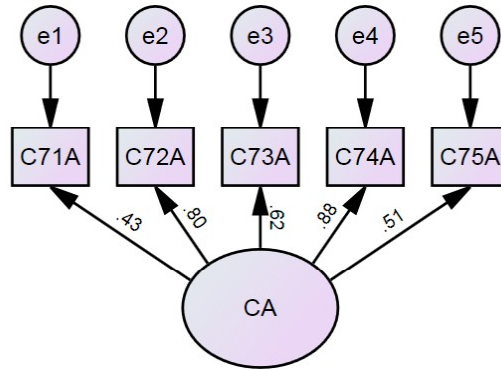
Fig 5.8 CFA results for CA

5.3.4.8 MM for construct – Knowledge Management Practices (KMPRA)

Knowledge management practice (KMPRA) was hypothesized to be a second-order latent identified by two first-order latent variables, namely – knowledge management practice for HR (KMPRAHR1) and knowledge management practice for IT (KMPRAIT1). The measurement of fitness of the construct initially started with ten exogenous variables - six for KMPRAHR1 named as C12A, C13A, C16A, C18A, C19A and C110A, and four for KMPRAIT1 as C22A, C27A, C28A and C29A. The confirmatory factor analysis was carried out to confirm the validity of the construct. The preliminary model fit results χ^2 / df = 2.085, CFI = 0.858, GFI = 0.817 indicated that in the first iteration itself fitness conditions are not satisfied. To improve the fit level of KMPRA, the measurement model guidelines mentioned in section 5.3.4 for good fit were applied. In the fourth iteration fit results indicate that the fitness conditions are satisfied, with variables C16A, C18A, C19A and C110A for KMPRAHR1 and C27A, C28A and C29A for KMPRAIT1. It may be observed that the variables related to KMPRAHR2 and KMPRAIT2 were not considered because of poor fit results. Table 5.15 indicates results of each iteration and Fig 5.9 shows number of variables obtained after final iteration.

Table 5.15 Iterations and Fit Indices for KMPRA

Iteration	χ2 / df	GFI	CFI	Variable (nos)	W/O	Variables									
1	2.085	0.817	0.858	10		C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
						C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
2	1.815	0.848	0.909	9	C22A	C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
						C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
3	1.850	0.876	0.924	8	C12A	C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
						C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
4	1.720	0.899	0.951	7	C13A	C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
						C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
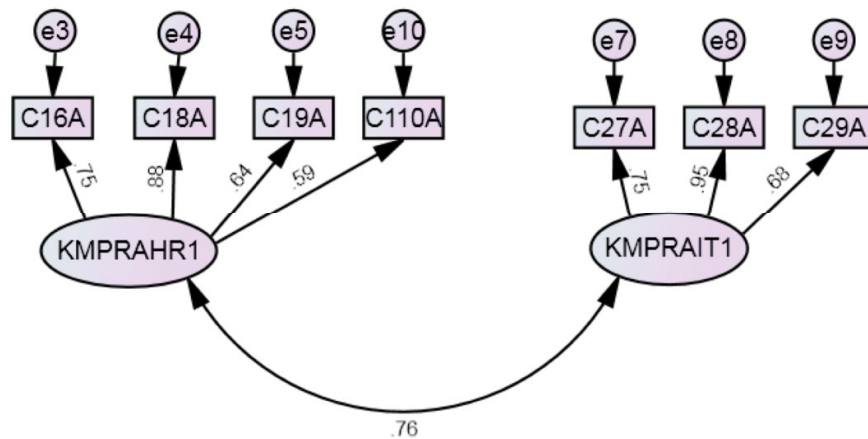
Fig 5.9 CFA results for KMPRA

5.3.4.9 MM for construct – Knowledge Management Processes (KMPRO)

Knowledge management process (KMPRO) was hypothesized to be a second-order latent identified by two first-order latent variables namely – knowledge management process to acquire knowledge (KMPROACQ), knowledge management process to use knowledge (KMPROUSE1) and knowledge management process to apply knowledge (KMPROAPP). The measurement of fitness of the construct initially started with twenty exogenous variables - seven for KMPROACQ named as C32A, C33A, C34A, C36A, C38A, C39A and C310A, five for KMPROUSE1as C52A, C53A, C54A, C55A

and C56A and eight for KMPROAPP named as C61A, C62A, C63A, C64A, C65A, C66A, C67A and C610. The confirmatory factor analysis was carried out to confirm the validity of the construct. The preliminary model fit results $\chi^2 / df = 2.236$, CFI = 0.705, GFI = 0.600 indicated that in the first iteration fitness conditions are not satisfied. To improve the fit level of KMPRO, the measurement model guidelines mentioned in section 5.3.4 for good fit were applied. In the seventh iteration fit results indicate that the fitness conditions are satisfied, with four variables namely C32A, C36A, C38A and C39A for KMPROACQ, with four variables namely C53A, C54A, C55A and C56A for KMPROUSE1 and six for KMPROAPP namely C61A, C62A, C64A, C66A, C67A and C610A. It may be mentioned that KMPROSHR1, KMPROSHR2 and KMPROUSE2 were not considered in this state due to poor fitness. Table 5.16 indicates results of each iteration and Fig 5.10 shows number of variables obtained after final iteration.

Table 5.16 Iterations and Fit Indices for KMPRO

Iteration	χ2 / df	GFI	CFI	Variable (nos)	W/O	Variables									
1	2.236	0.600	0.705	20		C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
2	2.121	0.641	0.737	19	C52A	C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
3	2.007	0.674	0.771	18	C63A	C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
4	2.063	0.689	0.778	17	C310A	C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
5	1.936	0.717	0.818	16	C33A	C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A

Table 5.16 (Contd..)

Iteration	χ2 / df	GFI	CFI	Variable (nos)	W/O	Variables									
6	1.800	0.750	0.854	15	C34A	C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
7	1.605	0.784	0.897	14	C65A	C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
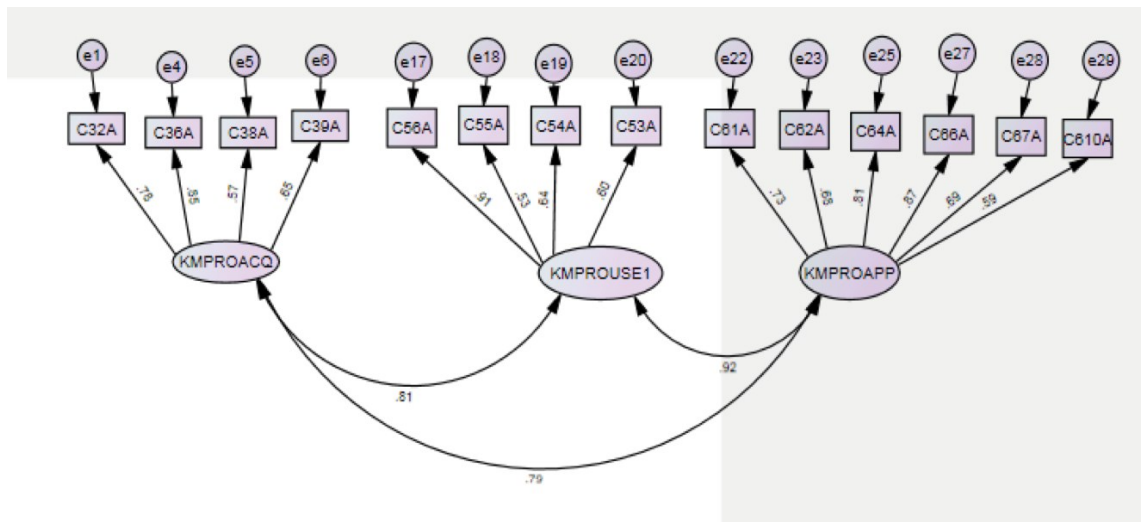
Fig 5.10 CFA Results for KMPRO

5.3.4.10 MM for construct – Knowledge Management (KM)

Overall knowledge management was hypothesized as a two-dimensional construct, one as knowledge management practice (KMPRA) and the other as knowledge management process (KMPRO). The measurement of fitness of the construct initially started with twenty-one exogenous variables – with four for KMPRAHR1 as C16A, C18A, C19A and C110A, three for KMPRAIT1 C27A, C28A and C29A, four for KMPROACQ named as C32A, C36A, C38A and C39A, four for KMPROUSE1 as C53A, C54A, C55A and C56A and six for KMPROAPP named as C61A, C62A, C64A, C66A, C67A and C610A. The confirmatory factor analysis was carried out to confirm the validity of the construct. The preliminary model fit results χ^2 / df = 1.654, CFI = 0.831, GFI = 0.698 indicated that in the first iteration fitness conditions are not

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satisfied. To improve the fit level of KM, the measurement model guidelines mentioned in section 5.3.4 for good fit were applied. In the fifth iteration fit results indicate that moderate fitness conditions are satisfied, with a total of seventeen variables - four for KMPRAHR1 as C16A, C18A, and C19A, three C27A, C28A and C29A for KMPRAIT1, four for KMPROACQ named as C32A, C36A and C39A, four for KMPROUSE1 as C53A, C54A and C56A and five for KMPROAPP named as C61A, C62A, C64A, C66A and C67A. Table 5.17 indicates results of each iteration and Fig 5.11 shows number of variables obtained after final iteration.

Table 5.17 Iterations and Fit Indices for KM

Iteration	χ^2/df	GFI	CFI	Variable (nos)	W/O	Variables									
1	1.654	0.698	0.831	21		C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
						C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
						C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
2	1.687	0.709	0.835	20	C55A	C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
						C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
						C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
3	1.656	0.726	0.852	19	C110A	C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
						C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
						C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
4	1.616	0.746	0.870	18	C38A	C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
						C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
						C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A

Table 5.17 (Contd..)

Iteration	χ2 / df	GFI	CFI	Variable (nos)	W/O	Variables									
						C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
						C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
5	1.561	0.765	0.890	17	C610A	C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A

Fig 5.11 CFA Results for KM

5.3.5 Development of final model

The preliminary step in developing the final KM model depicting the relationship between impact of KM practices and KM processes on competitive advantage began with seven constructs comprising of 65 variables. On these constructs exploratory

factor analysis was performed based on which 5 variables were dropped from further analysis, 1 from KMPRAIT, 1 from KMPROSHR and 3 from KMPROUSE due to cross-loadings on other factor. Further the confirmatory factor analysis was carried out for the individual constructs comprising of a total of 60 variables to confirm the validity of the constructs. The fit results of the individual constructs are summarized below:

Table 5.18 Summary of Fit Indices for Final Iteration and Total Variables for First and Final Iteration for Individual Constructs

Construct	Fit indices			Variables in	
	χ^2 / df	GFI	CFI	First Iteration	Final Iteration
KMPRAHR (KMPRAHR1+KMPRAHR2)	1.712	0.873	0.921	10 (7+3)	8 (6+2)
KMPRAIT (KMPRAIT1+KMRAIT2)	1.437	0.915	0.954	9 (5+4)	7 (4+3)
KMPROACQ	1.986	0.916	0.917	10	6
KMPROSHR (KMPROSHR1+KMPROSHR2)	1.691	0.942	0.963	9 (4+5)	6 (4+2)
KMPROUSE (KMPROUSE1+KMPROUSE2)	1.427	0.925	0.960	7 (5+2)	7 (5+2)
KMPROAPP	1.902	0.870	0.917	10	8
CA	2.147	0.939	0.936	5	5
Total				**60**	**47**

After the validity of individual constructs, validity of constructs KMPRA and KMPRO were analyzed. KMPRA comprises of constructs for practices pertaining to HR identified as KMPRAHR1 and KMPRAHR2 and construct of practices pertaining to IT identified as KMPRAIT1 and KMPRAIT2. The model fit guidelines were followed for various combinations of KMPRAHR1, KMPRAHR2, KMPRAIT1 and KMPRAIT2, the fit indices are satisfied for the construct KMPRA that comprised of KMPRAHR1 and KMPRAIT1 with total of 7 variables. Similarly, KMPRO comprises of constructs for processes pertaining to acquisition of knowledge as KMPROACQ, share of knowledge as KMPROSHR1 and KMPROSHR2, use knowledge as KMPROUSE1 and KMPROUSE2 and application of knowledge as KMPROAPP. The model fit guidelines for various combinations of process constructs, the fit indices are satisfied for the construct KMPRO that comprised of KMPROACQ, KMPROUSE1 and KMPROAPP with total of 14 variables. The fit results of the constructs KMPRO and KMPRA with total variables to be considered for final model are summarized below:

Table 5.19 Summary of Fit Indices for Final Iteration and Total Variables for First and Final Iteration for Combined Constructs KMPRA and KMPRIT

Construct	Fit indices			Variables in	
	χ^2 / df	GFI	CFI	First iteration	Final iteration
KMPRA (KMPRAHR1+KMPRAIT1)	1.720	0.899	0.951	10 (6+4)	7 (4+3)
KMPRO (KMPROACQ+KMPROUSE1+KMPROAPP)	1.605	0.784	0.897	19 (6+5+8)	14 (4+4+6)
Total				29	21

After the validity of combined constructs, validity of construct KM comprising of KMPRA and KMPRO were analyzed. The model fit guidelines for various combinations of construct for practice KMPRA and construct for process, the fit indices are satisfied for the construct KM that comprised of total of 17 variables.

Table 5.20 Summary of Fit Indices for Final Iteration and Total Variables for First and Final Iteration for Overall Construct KM

Construct	Fit indices			Variables in	
	χ^2 / df	GFI	CFI	First Iteration	Final Iteration
KM (KMPRA+KMPRO)	1.561	0.765	0.890	21 (7+14)	17 (6+11)

5.3.5.1 Overall measurement model with KMPRA, KMPRO and CA

Once the validity for the individual and combined constructs was evaluated, an overall measurement model was diagnosed for validity through confirmatory factor analysis. The measurement of fitness of the construct initially started with twenty-two exogenous variables three as C16A, C18A, and C19A for KMPRAHR1, three C27A, C28A and C29A for KMPRAIT1, three for KMPROACQ named as C32A, C36A and C39A, three as C53A, C54A and C56A for KMPROUSE1, five for KMPROAPP named as C61A, C62A, C64A, C66A and C67A, and five for CA named as C71A, C72A, C73A, C74A and C75A. The preliminary model fit results χ^2 / df = 1.583., CFI = 0.836, GFI = 0.713 indicated that in the first iteration fitness conditions are not satisfied. In the third iteration fit results indicate fitness conditions are satisfied. The fit indices results suggest that the overall measurement model provides a moderately good fit of the data. The examination of inter-construct correlations indicates a moderate level of association among the constructs. The three correlation coefficients between KMPRA and KMPRO, KMPRA and CA, and KMPRO and CA are significantly below the cut-

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off level of 0.90, suggest distinctness in constructs. Table 5.21 indicates results of each iteration and Fig 5.12 shows number of variables obtained after final iteration.

Table 5.21 Iterations and fit results for KMPRO+KMPRA+CA

Iteration	χ^2 / df	GFI	CFI	Variable (nos)	W/O	Variables									
1	1.583	0.713	0.836	22		C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
						C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
						C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
						C71A	C72A	C73A	C74A	C75A					
2	1.663	0.715	0.830	21	C71A	C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
						C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
						C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
						C71A	C72A	C73A	C74A	C75A					
3	1.478	0.740	0.881	20	C75A	C11A	C12A	C13A	C14A	C15A	C16A	C17A	C18A	C19A	C110A
						C21A	C22A	C23A	C24A	C25A	C26A	C27A	C28A	C29A	C210A
						C31A	C32A	C33A	C34A	C35A	C36A	C37A	C38A	C39A	C310A
						C51A	C52A	C53A	C54A	C55A	C56A	C57A	C58A	C59A	C510A
						C61A	C62A	C63A	C64A	C65A	C66A	C67A	C68A	C69A	C610A
						C71A	C72A	C73A	C74A	C75A					

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Fig 5.12 CFA results for overall model

5.3.5.2 Structural Equation Modelling

The final overall measurement model developed and assessed through various stages consists of three key constructs, namely KMPRA and KMPRO as second-order constructs and CA as first order construct. Finally, the SEM model is tested through multiple iterations by determining the fit indices for the relationship between KM (KMPRA and KMPRO) and CA. The third iteration resulted in a moderately fit model. The fit results of the final model that comprises of KM that includes KMPRA and KMPRO, and CA are presented in Table 5.22 with variables in the first and final iteration and Fig 5.13 shows number of variables obtained after final iteration.

Table 5.22 Summary Fit Indices and Total Variables for First and Final Iteration for Overall Model

Construct	Fit indices			Variables in	
	χ^2 / df	GFI	CFI	First iteration	Final iteration
KM and CA				17#	17#
	1.487	0.740	0.880	5@	3@
Total				22	20

indicate variables pertain to KM (KMPRA + KMPRO)
@ indicate variables pertain to CA

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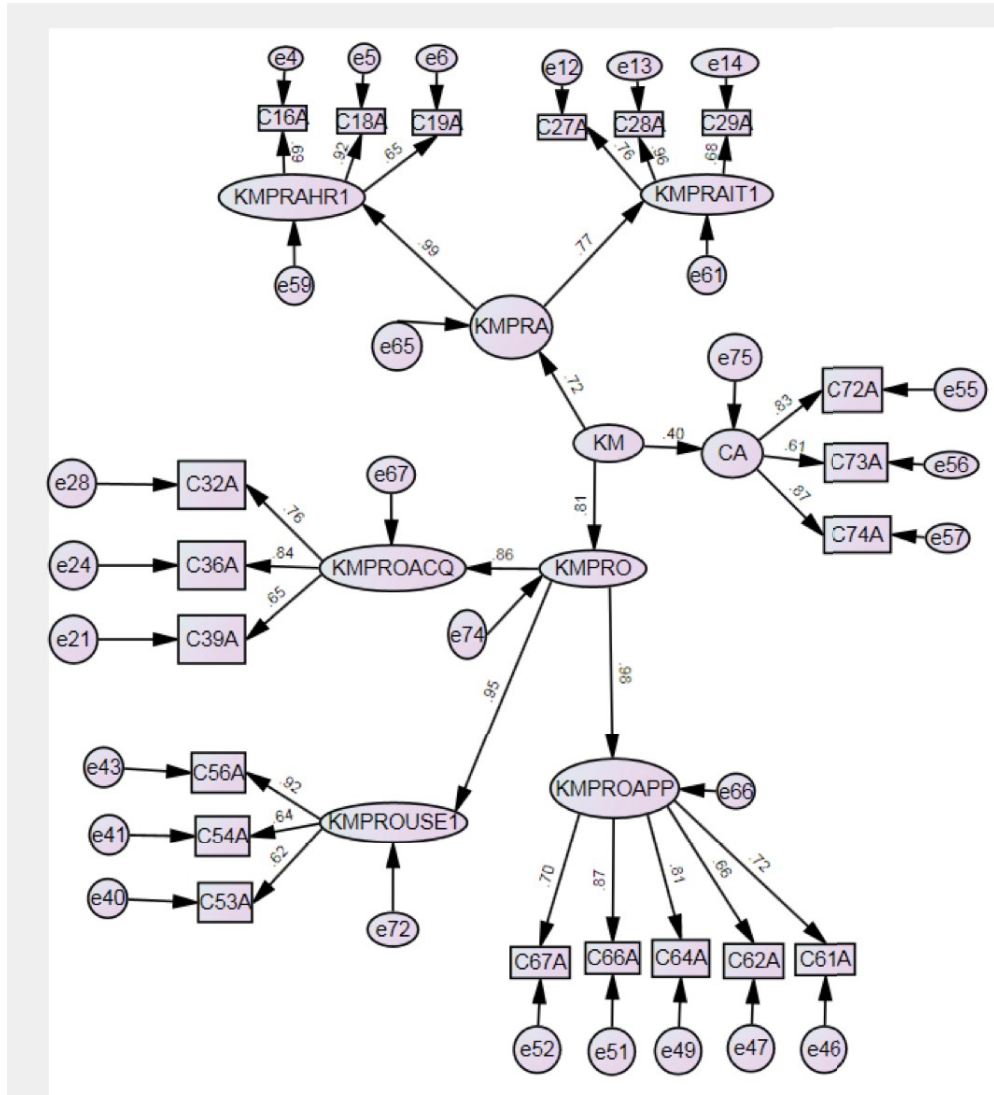
Fig 5.13 SEM for Overall Model

Thus from the final model that is moderately fit has a total of 20 variables, 17 key variables were identified from the knowledge management perspective that were having direct relationship with 3 vital parameters pertaining to competitiveness in cement industry. The three key variables for competitive advantage are related to – growth, profitability and innovation. These variables fall into the category of three constructs mentioned in Table 5.23 below:

Table 5.23 Final Model - List of 20 Variables and their Description

Construct	Variable	Variable description
KMPRA – KMPRAHR1	C16A	Encourages sales team to attend seminars, symposia and so on to learn newer ways of sales promotion
	C18A	Imparts formal training to sales team on "how to do" a cost benefit analysis before introducing discount
	C19A	Recognizes sales team that negotiates competitive credit terms with the dealers
KMPRA – KMPRAIT1	C27A	Provides IT solutions to analyze past and predict future price trends
	C28A	Provides IT solutions to ascertain impact of discount on the organizations profitability
	C29A	Provides IT solutions to change credit terms as agreed with the dealers
KMPRO-KMPROACQ	C32A	Has a process for sales team to generate the cement requirement of our dealers in my market
	C36A	Has a process for sales team to understand sales promotion strategies of competitors
	C39A	Has a process for sales tem to know the acceptable credit terms for dealer to sell our cement in the market
KMPRO-KMPROUSE1	C53A	Has a process for logistics team to develop the cement dispatch plan as per the available cement dispatch capacity through various modes (Rail, Road and Sea) and cement demand of dealers in the market
	C54A	Has a process for sales team to use the information about upcoming construction projects to develop the marketing plan to promote our cement in my market
	C56A	Has a process for sales team to develop new and effective sales promotion strategy
KMPRO-KMPROAPP	C61A	Has a process to apply our dealer expansion strategy to expand our dealer network in my market
	C62A	Has a process for logistics team to distribute cement as per developed distribution plan to our dealers in all the markets
	C64A	Has a process for sales team to implement the developed marketing plan to promote cement in my market
	C66A	Has a process for sales team to timely implement developed sales promotion strategy
	C67A	Has a process for sales team to respond to market with the developed product wise pricing strategy
CA		Competitiveness compared to our key competitors
	C72A	Our organization is growing faster
	C73A	Our organization is more profitable
	C74A	Our organization is more innovative

5.3.6 Hypotheses testing

A total of 30 hypotheses were framed, 10 each pertaining to KM processes, KM IT Practices and KM HR practices leading to deriving competitive advantage through knowledge management. The analysis of data and the findings there from reveal that 13 hypotheses were supported and the remaining 17 were rejected. It may be mentioned that out of 5 variables pertaining to competitive advantage in cement industry considered in the study to analyze the implication of knowledge management on the competitiveness compared to key competitors were – organization has a greater market

share, organization is growing faster, organization is more profitable, organization is more innovative and organization is more responsive to market demand. The three key variables pertaining to competitive advantage having critical value proposition identified are organization is growing faster, more profitable and more innovative based on knowledge management imperatives. Innovation is key to the growth in the 21st century which has emerged as a key variable resulting in deriving a competitive advantage. As such, an innovative company is expected to have a faster growth and could create benchmarks in critical marketing and sales function to derive greater profitability. The two variables under the competitive advantage which did not find a place based on the findings of the study in the context of cement industry are responsiveness to customer and the market share. This could be possibly because of greater homogeneity in product characteristics in a cement industry which leaves limited scope on the part of competitors to be responsive to customer by product differentiation. On the other hand, market share might not have emerged as a critical variable affecting competitiveness mainly because faster growth compared to competitors is expected to result in increase in market share. This forces players in the industry to play more with the pricing strategy as compared to product differentiation. Keeping in this view, the remaining 17 critical variables identified to develop a final model, hypothesis supported and rejected are given in subsequent paras.

5.3.6.1 Hypothesis pertaining to KM processes

Relationship of KM processes (Acquire, Share, Use and Apply) for outbound logistics with competitiveness

H1a: KM processes for channel management have positive relationship with competitiveness *Supported*

H1b: KM processes for inventory management have positive relationship with competitiveness *Supported*

H1c: KM processes for transportation management have positive relationship with competitiveness *Supported*

Above three hypotheses H1a, H1b and H1c have been supported by the study. These pertain to outbound logistics related to channel, inventory and dispatch plans by strengthening KM processes. Thus, the KM processes in a cement organization especially pertain to channels, inventory and modes of transportation play an important

role to timely meet customer requirements through dealer network. These three aspects of KM processes contribute significantly to the value chain through marketing and sales function for deriving competitive advantage and therefore need to be focused upon for deriving competitive advantage.

Relationship of KM processes (Acquire, Share, Use and Apply) for marketing and sales with competitiveness

H2a: KM processes for market identification and sales plan have positive relationship with competitiveness *Supported*

H2b: KM processes for advertisement strategies have positive relationship with competitiveness *Rejected*

H2c: KM processes for sales promotion schemes have positive relationship with competitiveness *Supported*

H2d: KM processes for pricing strategies have positive relationship with competitiveness *Supported*

H2e: KM processes for discount policies have positive relationship with competitiveness *Rejected*

H2f: KM processes for credit terms have positive relationship with competitiveness *Supported*

Out of the six hypotheses namely H2a to H2f pertaining to marketing and sales function; H2b, H2c, H2d and H2f were supported while H2b and H2e were rejected. The significance of supported hypothesis pertains to developing KM processes pertaining to sales force plans, sale promotion schemes, pricing strategies and credit terms. It is evident firm the supported hypotheses that sales force plans have emerged as a critical variable, as it has intelligence processes to know about the upcoming construction projects in their sales territories and pass over the same in a proactive manner to effectively plan marketing and sales related plans to promote cement. Sales promotion strategies which basically are the hallmark for success of companies has emerged as a critical variable which enables to understand, develop and implement effective KM processes that contribute directly to achieve goals. The findings also reveal that pricing strategies and credit terms are critical variables for cement industry from KM process perspective as they have greater bearing in the overall value chain

for deriving competitive advantage, as compared to advertising strategies and sales through discounts as a means for achieving goals. Both H5 and H8 hypotheses were rejected.

Relationship of KM processes (Acquire, Share, Use and Apply) for services with competitiveness

H3: KM processes for service level standards have positive relationship with competitiveness *Rejected*

The hypothesis H3 related to service through service levels standards pertaining to KM processes was rejected. This pertains to fulfillment of expectations of dealer in terms of response time, announcement of price change and discounts and fulfilling the orders. Although the service level is important but the study does not reveal it to be so. One may need to further explore this aspect through research.

5.3.6.2 Hypothesis pertaining to KM - HR practices

Relationship of KM HR practices for outbound logistics with competitiveness

H4a: KM HR practice of training for channel management have positive relationship with competitiveness *Rejected*

H4b: KM HR practice of reward for inventory decisions have positive relationship with competitiveness *Rejected*

H4c: KM HR practice of training for transport management have positive relationship with competitiveness *Rejected*

Relationship of KM HR practices for marketing and sales with competitiveness

H5a: KM HR practice of sales force rotation have positive relationship with competitiveness *Rejected*

H5b: KM HR practice of having small advertisement team have positive relationship with competitiveness *Rejected*

H5c: KM HR practice of training for sales promotion strategies have positive relationship with competitiveness *Supported*

H5d: KM HR practice of recognition for understanding price fluctuations have positive relationship with competitiveness *Rejected*

H5e: KM HR practice of training on discount schemes have positive relationship with competitiveness *Supported*

H5f: KM HR practice of training on credit term negotiations have positive relationship with competitiveness *Supported*

Relationship of KM HR practices for services with competitiveness

H6: KM HR practice of training on service levels have positive relationship with competitiveness *Rejected*

The three hypotheses namely – H5c, H5e and H5f were supported and remaining seven H4a, H4b, H4c, H5a, H5b, H5d and H6 were rejected. The hypotheses pertaining H5c, H5e and H5f pertain to human resource development practices through KM pertaining to participation of employees in seminars on sales promotion, training on carrying out cost benefit analysis of discount schemes and training on credit terms negotiations directly contributes to the value chain for deriving the competitive advantage. These three hypotheses also reveal the importance of learning about newer ways of sales promotion coupled with development of capabilities for credit terms negotiations and judicious extension of discounts based on overall knowledge about the dealers contributes much more than investing efforts on human resource development through channel related training strategies, inventory decisions, transport management approaches, sales force rotation policy, small team size deployment in advertisement function, recognition of understanding the price fluctuation and how to improve dealer satisfaction. It is evident from the above hypotheses testing that training particularly related to channels, inventory management, transportation management approaches which are mostly logistics in nature and are usually their knowledge is embedded in the TSM's and therefore may not require much investments for deriving competitive advantage as compared to other areas of training highlighted above. Similarly, rotation of sales force from one territory to another, small team size deployment in

advertisement function and recognition for price fluctuations does not contribute much value in the whole chain in cement industry.

5.3.6.3 Hypothesis pertaining to KM - IT practices

Relationship of KM IT practices for outbound logistics with competitiveness

H7a: KM IT practice of providing software solutions for dealer's information have positive relationship with competitiveness *Rejected*

H7b: KM IT practice of providing IT solutions for visibility of inventory to both dealer and logistics team have positive relationship with competitiveness *Rejected*

H7c: KM IT practice to support installation of global positioning system in trucks have positive relationship with competitiveness *Rejected*

Relationship of KM IT practices for marketing and sales with competitiveness

H8a: KM IT practice to support sales force by providing IT solutions and gadgets to acquire dealer's cement requirement and selling price have positive relationship with competitiveness *Rejected*

H8b: KM IT practice to support sales force with IT solutions and gadgets to capture advertisement of competitors have positive relationship with competitiveness *Rejected*

H8c: KM IT practice of providing IT solutions to analyze dealer wise sales pattern to devise sales promotion strategies have positive relationship with competitiveness *Rejected*

H8d: KM IT practice of providing IT solutions to analyze past and predict future price trends have positive relationship with competitiveness *Supported*

H8e: KM IT practice of providing IT solutions to ascertain impact of discount on organization's profitability have positive relationship with competitiveness *Supported*

H8f: KM IT practice of providing IT solution to change credit terms as agreed with the dealers have positive relationship with competitiveness *Supported*

Relationship of KM IT practices for services with competitiveness

H9:   KM IT practice of providing IT solution to respond with speed to dealer queries have positive relationship with competitiveness *Rejected*

The three hypotheses pertaining to KM practices for IT namely – H8d, H8e and H8f were supported and remaining seven hypotheses namely – H7a, H7b, H7c, H8a, H8b, H8c and H9 were rejected. IT input plays a greater critical role through KM practices especially pertaining to providing support for price analysis to analyze past prices and predict future prices, solutions to ascertain impact of discounts on profitability and solutions to change in credit terms as agreed with dealers. Thus, findings reveal that IT support through KM practices contributes great value through pricing, discount and credit terms decisions which need to be continuously examined through inputs from IT practices to derive competitive advantage. However, KM IT practices pertaining to channels information and visibility of inventory to both dealers and logistics teams does not contribute much value to the whole value chain. IT practices providing support in the form of solutions and gadgets in acquiring dealer requirement and price at which they sell cement, and capture advertisement of competitors was not found to be of greater relevance. The findings reveal that installation of GPS in trucks through IT practices does not contribute much value to the competitive advantage. This might have come up as the finding as in the Indian cement industry even today with the leading players like UltraTech, ACC and Ambuja have dedicated fleet of trucks that transports around 40-50% of the total requirement of market and even in the dedicated fleet the present use of GPS system is around 50-60%. In years to come the use of GPS system through IT practices is bound to increase as it does add much needed value to satisfy dealers requirement of timely delivery. However, the present status of industry and the responses received from the sample dos not support these hypotheses under the present circumstances.

Thus, the outcome of the research study based on supported or partially supported hypotheses testing suggests a model depicting KM processes and practices having direct relationship with competitiveness as below Fig 5.14 KM Model for Marketing and Sales Function
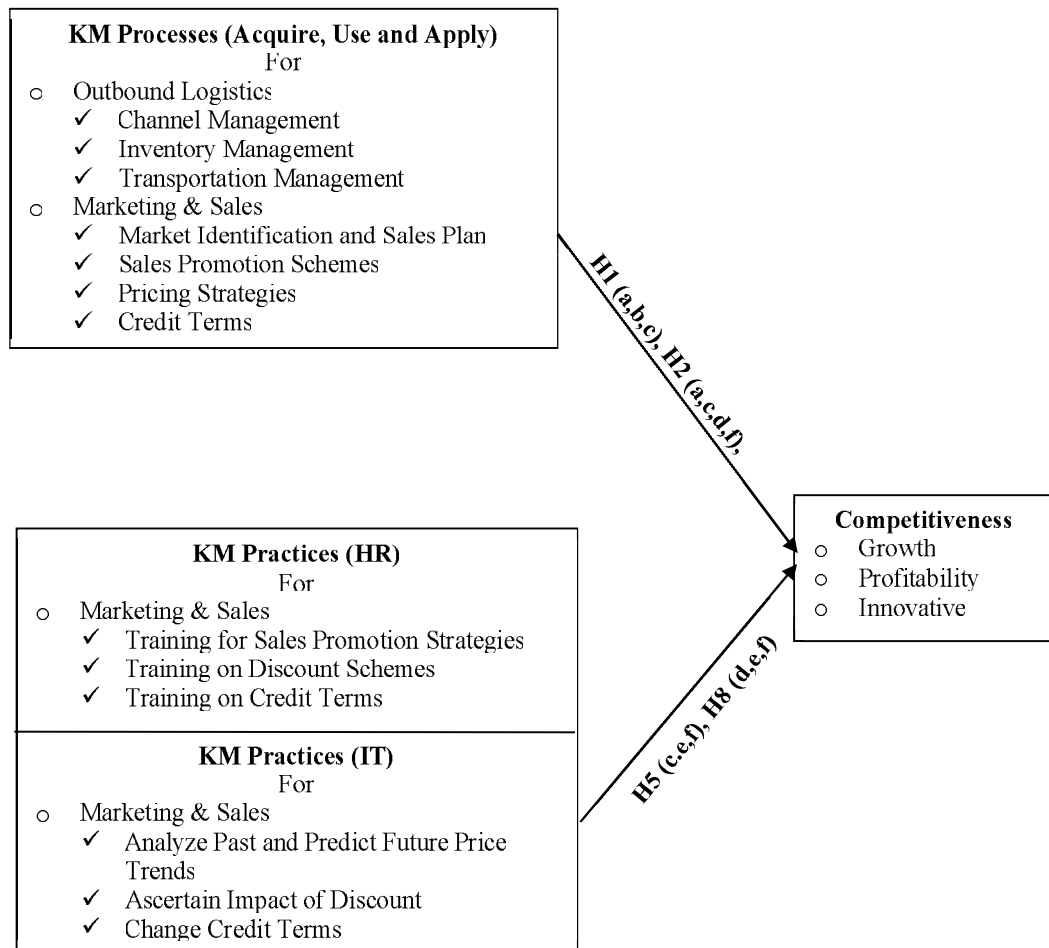
```
┌─────────────────────────────────────────┐
│      KM Processes (Acquire, Use and Apply) │
│                    For                     │
│   o  Outbound Logistics                    │
│      ✓  Channel Management                 │
│      ✓  Inventory Management               │
│      ✓  Transportation Management          │
│   o  Marketing & Sales                     │
│      ✓  Market Identification and Sales Plan │
│      ✓  Sales Promotion Schemes            │
│      ✓  Pricing Strategies                 │
│      ✓  Credit Terms                       │
└─────────────────────────────────────────┘
```

H1 (a,b,c), H2 (a,c,d,f),

```
┌─────────────────────────────────────────┐
│            KM Practices (HR)               │
│                    For                     │
│   o  Marketing & Sales                     │
│      ✓  Training for Sales Promotion Strategies │
│      ✓  Training on Discount Schemes       │
│      ✓  Training on Credit Terms           │
├─────────────────────────────────────────┤
│            KM Practices (IT)               │
│                    For                     │
│   o  Marketing & Sales                     │
│      ✓  Analyze Past and Predict Future Price │
│         Trends                             │
│      ✓  Ascertain Impact of Discount       │
│      ✓  Change Credit Terms                │
└─────────────────────────────────────────┘
```

```
┌──────────────────────┐
│    Competitiveness     │
│   o  Growth            │
│   o  Profitability     │
│   o  Innovative        │
└──────────────────────┘
```

H5 (c,e,f), H8 (d,e,f)

Fig 5.14 KM Model developed for Marketing and Sales Function

5.3.7 Strategic implications for competition through KM

The concrete implication arising from the model to improve the competitiveness through knowledge management in cement industry have mainly 17 distinct variables – 6 related to KM practice and 11 related to KM process. Based on the diagnostics of these 6 and 11 variables it is observed that certain variables had chain implication within knowledge management practice and certain within knowledge management process. However, there are few variables which had their independent contribution in improving competitiveness being part of either KM practice or KM process. Further observations emanating from the final model arrived at are comprehended below and the key focus areas that need to be focused the most to derive competitiveness through KM are presented in subsequent sections. It may be mentioned that services as the

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primary activity has not emerged either as a part of knowledge management practices or as a part of knowledge management processes. This may be possibly due to two reasons – one the respondents have sensed that the areas other than services will ultimately lead to customer service and two that the respondents have implicitly and tacitly presumed service related aspects are built in their day to day response to customer response.

5.3.7.1 KM Process related

KM process related key focus areas that play a significant role in deriving competitiveness in cement industry through knowledge management, as evident from this study are – sales promotion strategy, marketing plan, dealer requirement and dealer expansion strategy, pricing strategy, cement dispatch plan and credit terms are highlighted below:

Sales promotion strategy

The three variables C36A, C56A and C66A, all of which, sequentially come under three key knowledge management processes in the final model are namely - acquire, use and apply pertaining to sales promotion. The first focuses on the process for sales team to understand the sales promotion strategies of competitors, the second centers around developing new and effective sales promotion strategies and the last is the process for sales team to timely implement the developed sales promotion strategy. It is crucial for the marketing and sales team that would require continuous innovation to come-up with newer sales promotion strategies pertaining to – retailers, contractors, architects and individual house builders to be ahead of competition.

Marketing plan

The knowledge management process to develop the marketing plan to promote cement in the upcoming construction projects is identified by the variable C54A and thereafter the process to implement such a plan is identified by the variable C64A. Both play a significant role in the final model. The variable that relates to the process of identification of the upcoming construction projects is subdued in the final model. This could be as this part of the process in most of the companies is managed by the technical services team, which has standard operating guidelines.

Dealer requirement – Generate and Distribute

The two dimensions of cement requirement by dealers from the KM process point of view get reflected in the final model are C32A and C62A, the former deals with process for sales team to generate cement required by dealers and later the process by which logistics team distributes cement as per developed distribution plan. On the other hand, the explicit systems and processes laid down based on knowledge management inputs by the companies for the logistics team to develop the distribution plan based on cement requirement of dealers could be the reason for this variable not getting reflected in the final model.

Pricing strategy

The variable C67A plays an important role in the final model that relates to knowledge management process for the sales team to respond to market with the developed product wise pricing strategy. The process to obtain the price information daily market wise, dealer wise and product wise did not show up in the final model. This might be because of efficient processes and technology solutions deployed by the company for such work. Similarly, the variable for process to develop a market wise and product wise pricing strategy did not get reflected in the final model.

Dealer expansion strategy

The knowledge management process identified by the variable C61A has emerged in the final model that pertains to only application of dealer expansion strategy to expand dealer network in the market. This may be because companies continuously try to arrest the dealer attrition and simultaneously increase the total dealer base in order to increase their sales turnover. The acquisition of dealer information did not get reflected in the final model possibly due to efforts of companies over the years to maintain the dealer database and very little effort is required to update it. Similar to acquisition, use of dealer expansion strategy does not find place in the final model most likely because there is sufficient tacit knowledge available within the organization to formulate such strategy.

Cement dispatch plan

The knowledge management process identified by C53A has strongly emerged in the final model which is the core of logistics process. This variable focuses on the process for the logistics team to develop the cement dispatch plan as per the available cement dispatch capacity through various modes – rail, road and sea, and cement demand of the dealers in the market. The two variables did not form part of the final model – one that pertains to the process to acquire available capacities of various modes for cement dispatch as there may be fixed market norms that may be deep-rooted in the company and the other relates to standard operating processes to dispatch cement through various modes as per cement dispatch plan.

Credit terms

The knowledge management process identified through variable C39A conveys importance of acquiring the information at the TSM level from the market about the acceptable credit terms for dealers to sell cement in the market. The process to use such information to design credit terms that is beneficial to both dealer and company did not get reflected in the final model as these may be designed at the central office by the finance team. Since the designed credit terms may get implemented through ERP in most of the organizations, therefore might not have found place in the final model.

The above variables have been aptly identified in terms of "KM strategy to be closely aligned with new product development, competency, honing its selling strategy, and increasing the service orientation among the sales force (Karna, Singh, & Verma, 2010)". In the same study, the aspect of sales promotion strategy and building a strong relationship with customers which require being close to them and meeting them quite often have been emphatically emphasised for customer expansion through KM. This study has also corroborated developing system to make use of tacit knowledge of its employees to deliver value to the customers by developing effective sales and marketing plans. To substantiate further the need for KM within a large marketing department, companies need to use KM extensively for becoming more innovative, readier to cope with change, better able to access knowledge than competitors (Bennett & Gabriel, 1999). The need for KM and data mining for marketing for developing marketing plan requires strengthening of the KM process and arming the marketers with better knowledge of their customers would lead to better services (Shaw et al., 2001).This aspect of data mining for marketing would have direct implications on IT solution which have explicitly come as significant constructs under KM practices to not only develop marketing plan and also use IT solutions for price analysis, impact assessment of discounts and change in the credit terms. Therefore, KM process and practice related variables need to be viewed in an integrated manner that is one without the other would not yield effective outcomes. An empirical study in Greece reveals that customer-centric knowledge management requires a positive attitude and a desire to extract value for the organization by managing customer relationships over time. The organization, in order to really manage customer relationships, has to primarily develop a culture, motivating employees at all levels towards learning and facilitating them in capturing, selecting, using, and sharing knowledge by providing the means and the technology required to do so (Stefanou et al., 2003). Thus, for effective customer centric KM to derive competitiveness would require integration of process and practices related important variables that have emerged in the study.

5.3.7.2 KM Practice related to HR

The KM practice related key focus areas pertaining to human resources that have emerged as significant factors contributing to competitiveness are training for sales

promotion and cost benefit analysis, and recognition for negotiating credit terms as highlighted below:

Training for sales promotion

The knowledge management practice pertaining to HR as identified by the variable C16A emerges as a key variable that has a relationship and impacts competitiveness. According to this, companies that encourage sales team to attend seminars, symposia to learn newer ways of sales promotion would contribute significantly to derive competitive edge.

Training for cost benefit analysis

The variable identified as C18A relates to knowledge management HR practice focuses on training for TSM's on "How to do" a cost benefit analysis before introducing discount. This variable may impact competitiveness because it helps sharpen the capability of TSM's in making a decision about the level of discount that impacts overall profitability, while maintaining or enhancing competitiveness through sustained growth commensurate with profitability and innovation.

Recognition for negotiating competitive credit terms

The knowledge management HR practice of recognizing TSM's identified by variable C19A plays an important role in defining competitiveness. As per this variable organization recognizes sales team that negotiates competitive credit terms with the dealers. Thus recognition of negotiation capabilities by the organization in TSM's for arriving at the competitive credit terms resulting in developing competitive advantage through growth and profitability has emerged as one of the paramount variable which needs to be given importance in operationalizing strategies related to HR aspects of knowledge management.

The variables related to training, particularly to channels, inventory management, transportation modes, which are mostly logistics in nature, have not emerged as critical variables affecting competitiveness. The variables associated with rotation of sales

force from one territory to another, small team size deployment in advertisement function and recognition of price fluctuations do not contribute to deriving competitive advantage.

The relevance of human resource factors particularly pertaining to training and development have also been corroborated as an outcome of study highlighting strategic human resource practices being positively related to management capacity, which in turn, has positive effect on innovation (Chen & Huang, 2009). The aspect of human resource management from the perspective of training, decision making, performance appraisal and compensation and reward with five areas of KM that is from acquisition, documentation, transfer, creation to application requires a distinct thrust and approach in knowledge organizations as compared to non-knowledge organizations. This study also identifies design of a compensation and rewards system that should promote group performance, knowledge sharing and innovative thinking (Yahya & Goh, 2002).The aspect of rewards, knowledge sharing with non-monetary incentives, knowledge creation with monetary incentives to be made part and parcel of performance evaluation by integrating HRM practices with ICT practices have been distinctly established to have an impact on competitiveness and economic performance (Andreeva & Kianto, 2012). Thus, from literature review multiple studies have corroborated the need for HRM practices pertaining to KM, specifically from training and recognition point of view for deriving competitiveness through KM.

5.3.7.3 KM Practice related to IT

The KM practice related key focus areas pertaining to information technology solutions that have emerged as significant factors contributing to competitiveness are IT solution for price analyses, impact assessment of discounts and to change credit terms as highlighted below:

IT solution for price analyses

The variable identified as C27A relates to knowledge management IT practice for providing IT solutions to analyze past and predict future price. Thus, analysis of past prices to predict future price trends is an important variable that could be used for

enhancing competitiveness. This has emerged as a significant variable in terms of demand vis-à-vis, prices which vary a lot from location to location in the cement industry. This aspect not only contributes to growth but more so in terms of profitability.

IT solution for impact assessment of discounts

The knowledge management IT practice of providing IT solutions identified by variable C28A plays a vital role in the final model to derive competitiveness. As per this variable, organization provides IT solution to ascertain impact of discount on the organizations' profitability. This may be important as discounts are critical part of cement sales process and IT solution helps team to take a calculated decision while deciding the amount of discounts offered and in turn contribute towards competitiveness through profitability related variables.

IT solution to change credit terms

The knowledge management practice pertaining to IT as identified by the variable C29A emerges as a key variable that has an impact on competitiveness. According to this, companies provide IT solutions to change credit terms as agreed upon with the dealers. This instant input to the ERP facilitates the implication on cash flows of the company which act as a double benefit that is retaining existing customer base for enhanced sales in future and by marginally having improved on profitability.

The variables pertaining to channels information and visibility of inventory to both dealers and logistics teams does not find a place in the final model. Similarly, variable related to IT practice that deals with installation of GPS in trucks does not contribute in deriving a competitive advantage.

Thus, from the hypotheses testing pertaining to knowledge management process and practices pertaining to marketing and sales functions in the cement industry for deriving competitive advantage and the relevance of above discussed variables under different aspects of knowledge management have been discussed.

There are few studies from the literature review that substantiates the relevance of IT practices including data mining to be used for coming out with IT solutions to improve competitiveness in general. The need for KM and data mining for developing marketing plan requires strengthening of the KM process and arming the marketers with better knowledge of their customers (Shaw et al., 2001).The empirical findings based on a survey among major Taiwanese firms suggest that management of both endogenous and exogenous knowledge through IT applications significantly enhances dynamic capabilities and thus enhance business excellence and competitive advantage (Sher & Lee, 2004). A study suggests that in order to scan through the data and provide information that can directly aid in decision-making, BI technologies help in identifying hidden patterns and unapparent trends within the data. However, BI is more of a tool that helps in handling and making sense out of the knowledge existing in databases and data warehouses (Karna et al., 2010).

A study reveals that HRM and ICT practices are quite strongly correlated and have a statistically significant influence on both financial performance and competitiveness. ICT is capable of supporting management decisions, sharing data and information, knowledge and expertise with all stakeholders in the organization's extended value chain and support daily work (Andreeva & Kianto, 2012).

Thus, from literature review multiple studies have corroborated the need for ICT practices pertaining to KM, specifically ICT solutions to support decision making and routine operations for deriving competitiveness through KM

From the overall KM perspective, the important benefits of KM in the organizations surveyed are improved efficiency, improved decision-making, improved responsiveness, improved innovation, sharing of best practices and lower cost (Singh et al., 2006). An empirical examination of studies suggest that organizational resources are positively and significantly related with strategic flexibility, and KM process capability partially mediates these relationships (Bamel & Bamel, 2018).

The key strategic thrust areas by imbibing knowledge management processes and practices in a cement industry that would have a greater bearing on deriving competitive advantage are as under:

5.3.8 Key Strategic thrust areas for deriving competitive advantage through KM

Sales promotion: This thrust area has emerged as the domain that may be impacted by both KM practice and KM process. The KM practice for this area suggests human resource development of sales team by way of sending them to attend seminars, symposia etc. to learn newer ways of sales promotion techniques. This learning in turn enables the sales team to be innovative in designing sales promotion strategies. The KM process pertaining to sales promotion recommends focus on three stages - understanding strategies of competitors, developing new and effective sales promotion strategies and their timely implementation. The implications of knowledge management in the area of sales promotion strategies to derive competitive advantage has emerged as the single most critical aspect that need to improve continuously in cement industry. In years to come, amidst challenging competitive environment; cement industry has to depend more and more on evidence based sales promotion strategies and keep coming out with innovative strategies to promote sales.

Marketing plan: Developing a robust marketing plans and effectively executing them by recourse to relevant knowledge management inputs contributes to faster growth of the company. This aspect emerges as an important input for deriving competitive advantage and basically requires continuously knowledge and intelligence related inputs from a sales force, Study has revealed that more than preparing a marketing plan, providing allocating due resources becomes a prerequisite for effective implementation.

Dealer expansion: In view of the excess capacity of cement production created by cement companies in India it is critical for companies to find methods to register growth in cement sales ahead of the competitors. The most effective method to achieve this is to have a large pool of dealers who have capability and capacity to sell cement. While formulating the dealer expansion strategy is important the effective implementation of such strategy is extremely critical to expand dealer network.

Demand and supply: One of the key challenge for the cement industry is to timely cater to the requirement of dealers spread across geographical territories. This requires continuous logistics planning and optimization on transportation of cement through appropriate modes. This aspect from logistics point of view has emanated as a critical input. Professionals in the cement industry need to continuously acquire data on demand of dealers and match it with appropriate strategies to ensure that such knowledge management inputs get duly incorporated to ensure delivery to dealers on time. This challenge from knowledge management perspective gets complicated particularly from the point of view of small dealers having requirements which does not help companies to optimally use capacities available from rail, road and sea. This invariably results in mismatching of the demand and supply and in turn may result in additional cost to be incurred by the company. The use of live database across dealer network in different geographical territories helps in developing strategies which may result in minimizing additional cost implications.

Price and Discount: The combined impact of discount and price influences the profitability in a cement company. The desired benefit of discount could be acquired through HR and IT practice by training sales team on "how to do" cost benefit analysis of the proposed discount that may be introduced in the market that is supported by IT solutions to carry out such analysis. IT solutions need to be effectively deployed for analysis of past to predict future prices, so as to develop effective implementation of pricing strategies resulting in enhanced profit and profitability. The application of knowledge management processes and practices pertaining to pricing decisions for swiftly catering to the demand would play a critical role in this matter.

Credit terms: It is evident from the findings of the study that acceptable and judicious credit terms for dealers to sell cement in the market coupled with having a system to provide IT solutions to change credit terms as agreed upon by the dealers contributes to achieve higher sales with marginally adverse implications on profit. However, to retain competitive edge in the market such trade-offs based on IT solutions become a natural imperative. On this aspect of credit terms, the study also reveals that recognizing sales team that negotiates better credit terms results in greater advantage to the company by investing marginal sum on recognizing sales team through tangible benefits. Thus,

knowledge management inputs for coming out with rational and objective credit terms for dealers plays a significant role for increased sales and profits.

5.4 Conclusion

This chapter begins the section with the profile of respondents and the next section deals with the analysis of data that comprises of EFA and CFA. The final model based on the model fit criteria was arrived at which contains 20 critical variables – 11 pertain to KM process, 6 to KM practices and 3 to competitive advantage. Subsequently, hypotheses supported and rejected were presented. Keeping in view the final model, strategic thrust areas for deriving competitive advantage through KM were discussed.