CHAPTER 4

RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

The previous chapter 3 proposed a theoretical model and the hypothesis based on the research gaps identified in chapter 2. The model proposes to study the linkage between KM practices and process, and competitive advantage in its marketing and sales function of a cement industry in India. For this study a total of seven constructs comprising 65 variables have been developed to measure - KM practices pertaining to Information Technology (IT), KM practices pertaining to Human Resources (HR), KM process to acquire knowledge from market, KM process to share knowledge within the organization, KM process to use knowledge within the organization, KM process to apply knowledge back in to the market for gaining competitive advantage over competitors. This chapter discusses the research design and methodology adopted to test the theoretical model proposed in Chapter 3 for this study. The key steps deliberated upon are as under:

- Selection of research design
- Selection of survey method
- Selection of survey research unit
- Questionnaire design for survey
- Tools and techniques for data analysis
- Administering survey questionnaire for main study

4.2 Selection of Research Design

A research design provides a framework for undertaking a study to diagnose research questions. A choice of research design reflects decisions about the priority given to a range of dimensions of the research process (Bryman, 2012). Research design is broadly classified into two categories – exploratory and conclusive (Fig 4.1). Exploratory research is used to define the problem more accurately and find relevant course of action (Malhotra, 1999) and this type of research rarely yields a definitive answer (Neuman, 2014). Conclusive research is more appropriate and organized

compared to exploratory research. This is further classified into two – descriptive and causal. The main purpose of descriptive is to describe about market characteristics or functions, whereas causal emphasizes on finding the evidence of cause-and-effect relationship. The two sub-categories of descriptive research design are cross-sectional design and longitudinal design. The former focuses on collection of information from any given sample of population elements only once and the later on repeatedly measuring fixed sample of population elements. The cross-sectional design is further divided into two – single cross-sectional design and multiple cross-sectional design. In single cross-sectional design one sample of respondents is drawn from the target population and information is obtained from this sample once, while in multiple cross-sectional design there are two or more samples of respondents, and information from each sample is obtained only once (Malhotra, 1999).

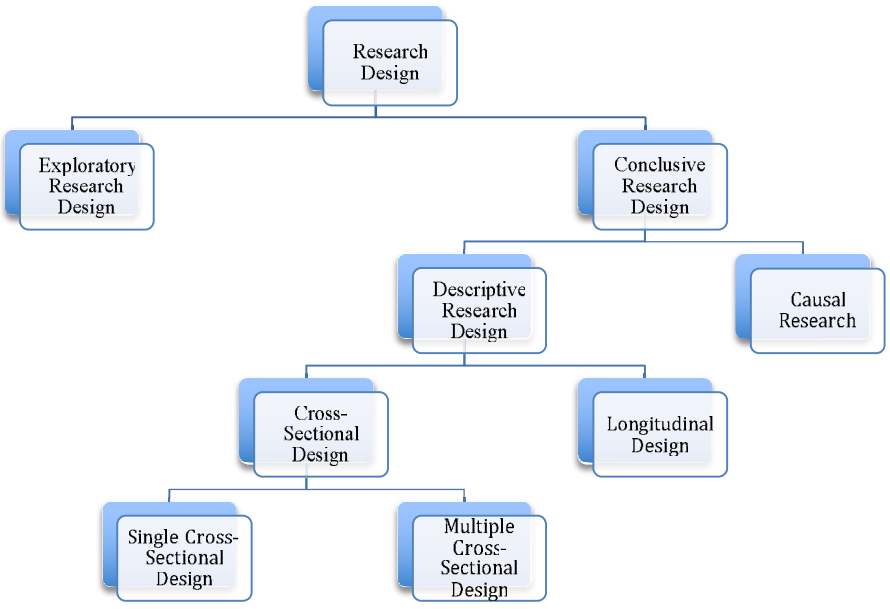

Fig 4.1 A Classification of Research Design

A comparison of the three types of research designs is given in Table 4.1

Table 4.1 Research Designs

S. No.	Criteria	Exploratory	Descriptive	Causal
1	Objective	Discovery of ideas and insights	Describe market characteristics or functions	Determine cause and effect relationship
2	Characteristics	a. Flexible, versatile b. Often the front end of total research design	a. Marked by the prior formulation of specific hypotheses b. Preplanned and structured design	a. Manipulation of one or more independent variables b. Control other mediating variables
3	Methods	a. Expert surveys b. Pilot surveys c. Secondary data d. Qualitative research	a. Secondary data b. Surveys c. Panels d. Observational and other data	Experiments

Source: (Malhotra, 1999), page 85

The first objective of this study is to identify the components of knowledge management and competitiveness, and second to understand the relationship between knowledge management and competitiveness with reference to the marketing and sales function of the Indian cement industry. For the first objective exploratory design technique was used by way of initially carrying out the exhaustive literature survey to identify the components of knowledge management and competiveness, and its applicability through design of questionnaire for the cement marketing followed by in-depth discussion with the experts both from the cement industry and academics. The second objective of the research is to determine the relationship between the independent variables of KM practices and processes, and the dependent variables of competitive advantage in the marketing and sales function of the cement industry in India. For the second objective descriptive research design of single cross-sectional design nature was adopted. This is because respondents' TSM's in this study are drawn from target population and information is only sought once from the respondents employed in the marketing and sales function of the cement industry in India.

4.3 Selection of Survey Method

The survey method is deployed to seek information for the questionnaire designed to test the hypothesis. Mostly, structured data collection approach is used wherein questions are arranged in a certain order. There are four types of survey methods used to seek response to the questions from the respondents (Malhotra, 1999). There are various types of survey methods – mail surveys, internet surveys, telephone surveys, group-administered surveys and face-to-face interviews - each has its own advantage and disadvantage (Bordens & Abbott, 2006). A brief summary about each method is mentioned below:

Table 4.2 Survey Methods: Key Feature, Advantage and Disadvantage

S. No.	Survey Method	Key Feature	Advantage	Disadvantage
1	Mail	It is sent directly to the participant with self addressed envelope and requested to complete and return	It is a convenient method	It may not yield right results, if the responses are disproportionate
2	Internet	It is distributed through email or posted on web	It allows to create and present complex questionnaire And helps to reach large body of potential participants	The respondents may not be representative of population and without resources it is difficult to post the survey
3	Telephone	It is carried out through telephone call to the respondents	It can be administered more easily over phone compared to a written form	Respondents are generally reluctant to respond because of plethora of junk calls and government laws to protect from unwanted calls
4	Group-administered	It is to administer the survey when large number of respondents are available at one location	It allows to complete the survey in short time and little effort is required.	Respondents may not take it seriously in the group as they would have taken it alone. And some may feel pressure to respond.
5	Face-to-Face interviews	To speak with the respondent at office, home or any other suitable place	This removes variations in the data that result from differences in when and how questions are asked.	The appearance and conduct of the interviewer may affect the response. Slight change in the way interviewer asks the question may affect the results.

Source: (Bordens & Abbott, 2006), page 240-245

In this research study a combination of mail and internet method was used to administer the questionnaire. The survey questionnaire was sent in two ways to the respondents – (a) as an attachment through internet and respondents were requested to fill the questionnaire and send it back through post or scan the filled questionnaire and send it back through email and (b) A web page was developed for the questionnaire and the link of this web page was sent along with the email in which the questionnaire was attached. A total of 120 responses were received of which 66% through email that had filled response as an attachment, 21% through web link and 13% through post. The internet as a tool for survey method was quite useful as most of the respondents for this study had access to internet and this method provides faster reach to the respondents.

4.4 Selection of Survey Research Unit

4.4.1 Organization structure of marketing and sales function

A cement organization has a head who manages both the functions, marketing and manufacturing of cement business, usually named as "Business Head". The manufacturing function deals with the cement production and the marketing with cement sales and marketing. The marketing function has four levels, namely – national (NH), zonal (ZH), regional (RH) and TSM. Their geographical coverage is mentioned in Table 4.3. The NH is at the highest level and TSM being at the lowest level in hierarchy. While the nature of strategic aspects of the job reduces from level of NH to TSM the operational nature of job increases. In addition to marketing and sales function NH also oversees functions such as marketing services, supply chain management, technical services, information technology, human resources and finance and accounts. A brief explanation of each function and its deliverable is mentioned in Table 4.4.

Table 4.3 Level and Geographical Coverage

S. No.	Level	Geographical Coverage
1	NH (National Head)	At all India level
2	ZH (Zonal Head)	At zonal level means cluster of two or more than two Regions
3	RH (Regional Head)	At regional level means one or cluster of more than two States
4	Territory Sales Manager (TSM)	At territory level means one or cluster of more than two Districts

Table 4.4 Functions and their Deliverable

S. No	Function	Deliverable of the Function
1	Mktg. (Marketing and Sales)	To manage and grow existing dealer network to increase sales and profitability through appropriate pricing
2	MS (Marketing Services)	To manage brand, design, develop and implement sales promotional and advertising strategies
3	SCM (Supply Chain Management)	To manage supply of cement from plant to dealer godowns through a combination of modes rail, road and sea, and ensure on time delivery with minimum supply chain cost
4	TS (Technical Services)	To communicate technical aspects of cement, such as – setting time, strength, color of cement etc to end-users, organize technical meets for masons and architects, and handle technical complaints of cement
5	IT (Information Technology)	To manage IT hardware and ensure connectivity across marketing offices. Develop and implement software solutions such as ERP to manage end to end sales transactions, mobility solutions for market intelligence
6	HR (Human Resources)	To manage entire HR cycle for all the functions, such as – hire, induct, train, reward & recognition, transfer. performance appraisal, separation
7	F&A (Finance and Accounts)	To ensure sales is accounted as per the accounting standards

4.4.2 Definition of TSM

TSM (Territory Sales Manager) or its equivalent called as ASM (Area Sales Manager) is the person closest to the market. The person is responsible for marketing and sales of cement to the existing dealers in the market, grow the dealer network, implement the credit and discount policies, IT initiatives and sales promotion strategies. He has in-depth knowledge of his territory and is the backbone of the entire marketing and sales function that connects the leadership of the organization with the on ground implementation of its policies.

4.4.3 Rationale for selection of TSM

TSM is responsible for implementation of policies, strategies and IT initiatives at the market. He is also the user of practices adopted for implementation of such policies. He gathers market intelligence about the overall market condition such as strategy of competitors, cement demand, supply chain capability and availability which are critical for overall decision making across levels in organization. The market intelligence so gathered is used for a variety of purposes by all the functions (Table 4.4). Therefore, research undertaken in this study has considered "TSM" as the survey research unit.

4.4.4 Population of TSM

Population basically is the universe of units from which sample is to be selected (Bryman, 2012). For this study population is the set of all TSM (Territory Sales Managers) employed in marketing and sales domain of cement organizations in India. TSM typically is responsible for marketing and sales of cement for a district or cluster of districts of a state. The TSM is normally at the fourth level in the hierarchy in the organization structure of the cement organization. It is estimated that there are a total of around 950 number of TSM's in cement organizations in India. Since there is no published data for the TSM population, it was estimated through telephonic discussion with two cement marketing professionals having more than 20 years of experience in cement marketing and sales in multiple geographies and a consultant employed with a renowned cement consulting company based in Delhi. As per the recommendation of the senior professionals and the consultant, on an average a TSM is responsible for sell of 15000 metric ton of cement per month (0.18 million tons per annum) to the dealers that sale to the customers of the residential segment.

The following steps were used to arrive at the population of TSM for the year 2015 in India. The numbers from step 1 to step 5 are in million tons.

Step 1 – Total installed capacity of cement	421.90
Step 2 – Total production of cement	316.40
Step 3 – Total cement exports	1.55
Step 4 – Total cement available for domestic consumption	314.88
Step 5 – Segment wise split of domestic consumption	
- Infrastructure (28.5%)	89.74
- Commercial (16.5%)	51.96
- Residential (55%)	173.18

Thus, based on 173.18 million tons of cement sales in the residential segment and one TSM being responsible for 0.18 million ton of cement the total number of TSM's in India are (173.18/0.18) = 962

4.5 Questionnaire Design for the Survey

A questionnaire is a structured technique for data collection consisting of a series of questions, written or verbal, to which a respondent replies (Malhotra, 1999). The questionnaire was developed to measure seven constructs of the proposed theoretical model (as mentioned in chapter 4). For each of the constructs themes based on literature were identified around which questionnaire was developed. These themes such as HR practices – rewards, recognition, training etc, IT practices – solution, software, gadgets etc, and processes to acquire knowledge from market, share knowledge within organization across stakeholders, use knowledge to devise strategy to derive edge over competitors and finally apply knowledge that is the devised strategy back into the market. These were then applied in context of the marketing and sales function of the cement organization based out of India. Keeping in view the literature review measuring constructs in the following areas have been developed.

4.5.1 Generation of scale item based on literature review

4.5.1.1 Measures for KM practice pertaining to HR (KMPRAHR)

A study suggests that the people (human beings) are central to KM initiatives. A serious KM implementation in an organization requires interaction people have among themselves, interaction people have with technology and techniques people employ in using the technology is important (Bhatt, 2001). A Spanish company Irzar a maker of luxury coach bodywork successfully implemented KM strategy with people as the differentiator and emphasized on recruitment and training of the employees (Forcadell & Guadamillas, 2002). KM addresses the critical issues of organizational adaptation, survival and competence in a rapidly evolving environment. KM embodies organizational processes that seek a synergistic combination of the data and information processing capabilities of ICT, and the creative and innovative capacity of human beings to improve ICT (Berawi, 2004). KM from human resources point of view focuses on task-shaped skills wherein an employee not only understands his own tasks but understand tasks of others and communicates across departments to derive competitive advantage (Chuang, 2004). A KM model with focus on HRM and IT practice is a reliable and valid instrument to measure and predict relationship between

KM practice and innovation (Gloet & Terziovski, 2004). One of the studies identified KM practices of HR as sourcing of people, recognition and reward, and believed these to be directly related to organizational performance (Zack et al., 2009). HRM practices fuels knowledge behaviors among employees and contribute to create competitive advantage and high performance in organization. The HRM practices focused in the study was to reward employees with monetary and non-monetary incentive for sharing knowledge and consider this as an integral component of performance of evaluation (Andreeva & Kianto, 2012).

It can be summarized that the people had emerged as the overall focus for successful implementation of KM. The themes to measure HR practices can be identified as: Reward, Recognition, Training, Experience and Team size. Keeping the above in view questions for KMPRAHR have been developed.

Table 4.5 Questions for KMPRAHR (included in questionnaire)

Code	Focus area	Statement
		My organization…
C11A	Channel	Provides formal training programs to train teams on "How to manage dealers effectively?"
C12A	Inventory	Rewards team with non-monetary incentive to maintain inventory at dealer godowns as per the demand of the dealers.
C13A	Transport	Imparts formal training to logistics team on "How to arrange fleet of varying capacities as per the demand of the dealer.
C14A	Sales Force	Rotates sales team every three years to a different market to provide experience of managing various types of dealer.
C15A	Advertising	Has a small advertising team that engages effectively with multiple advertising agencies for advertisement of our cement.
C16A	Sales Promotion	Encourages sales team to attend seminars, symposia and so on tc learn newer ways of sales promotion.
C17A	Price	Recognizes the sales team that understands the fluctuation of cement price in the market.
C18A	Discount	Imparts formal training to sales team on "how to do" a cost benefit analysis before introducing a discount.
C19A	Credit Terms	Recognizes sales team that negotiates competitive credit terms with the dealers.
C110A	Service	Imparts formal training to sales team on "How to improve dealer satisfaction"?

4.5.1.2 Measures for KM practice pertaining to IT (KMPRAIT)

The foundation of KM initiatives is to share and create knowledge through the development of databases and use of collaborative technologies such as internet or groupware (Civi, 2000). The technology could be used to increase the efficiency of people and enhance information flow within organization (Bhatt, 2001). The KM initiative encompasses the creative and innovative capacity of human beings to improve ICT to meet challenges and develop high quality products (Berawi, 2004). The KM from IT perspective uses technology to cooperate with each other within the organization to search new knowledge and to retrieve knowledge about its products, processes, markets and competition to derive competitive advantage over its competition (Chuang, 2004). A KM model with focus on HRM and IT practice is a valid and reliable instrument to measure and predict relationship between KM practice and innovation (Gloet & Terziovski, 2004). The KM practice identified related to IT was to look for opportunities to experiment and learn more about technologies and internal operations, that had a direct linkage with organizational performance (Zack et al., 2009). The effective and efficient management of organizational knowledge was enabled through ICT practices to develop competitive advantage. The ICT practice serves three purposes - supports management in taking decision, its architecture to share data and information across stakeholders, and systems to support daily work (Andreeva & Kianto, 2012).

It could be summarized that IT is the backbone of KM initiative. The themes that emerge for IT practices can be distinctly identified as: Solution (software), Gadgets (hardware) and support (services). Keeping the above in view following questions for KMPRAIT have been developed.

Table 4.6 Questions for KMPRAIT (included in questionnaire)

Code	Focus area	Statement
		My organization…
C21A	Channel	Provides IT solutions to update and retrieve information about dealers of my market.
C22A	Inventory	Provides IT solutions to give visibility of inventory at dealer godowns to sales and logistics teams.
C23A	Transport	Provides IT support to install global positioning system (GPS) in their trucks to track their movement.
C24A	Sales Force	Provides sales team with IT solutions and gadgets to acquire from dealers their cement requirement and price at which they sell cement to the retailers.

Table 4.6 (Contd..)

Code	Focus area	Statement
C25A	Advertising	Provides sales team with IT solution and gadgets to capture advertisement of the competitors.
C26A	Sales Promotion	Provides IT solution to analyze dealer wise sales pattern to devise sales promotion strategies.
C27A	Price	Provides IT solutions to analyze past and predict future price trends.
C28A	Discount	Provides IT solutions to ascertain impact of discount on the organizations profitability.
C29A	Credit Terms	Provides IT solutions to change credit terms as agreed with the dealers.
C210A	Service	Provides IT solutions to respond with speed to variety of dealer queries, such as: sales, payment, discounts, dispatch of cement etc

4.5.1.3 Measures for KM process to "Acquire" knowledge (KMPROAQR)

KM process to acquire knowledge refers to efforts organizations make to know about customer requirements (Forcadell & Guadamillas, 2002), acquisition of consumer needs (Darroch & McNaughton, 2003), anticipate the needs of the market place (Berawi, 2004), discovery of new knowledge (Chuang, 2004), and learn more about customers, products and services (Zack et al., 2009). Keeping in view the construct identified from the literature review following questions were incorporated in questionnaire to understand the implications of acquisition of KM process.

Table 4.7 Questions for KMPROACQ (included in questionnaire)

Code	Focus area	Statement
		My organization…
C21A	Channel	Has a process for acquiring information about all cement dealers operating in my market.
C22A	Inventory	Has a process for sales team to generate the cement requirement of our dealers in my market.
C23A	Transport	Has a process for logistics team to find available capacity of various modes (Rail, Road and Sea) for cement dispatch.
C24A	Sales Force	Has a process for sales team to identify upcoming construction projects in my market.
C25A	Advertising	Has a process for sales team to capture the advertisement of cement products of our competitors.
C26A	Sales Promotion	Has a process for sales team to understand sales promotion strategies of competitors.
C27A	Price	Has a process for sales team to obtain daily market wise, dealer wise, product wise prices of cement per bag.
C28A	Discount	Has a process for sales team to know the acceptable discount per bag of cement by the dealer in the market.
C29A	Credit Terms	Has a process for sales team to know the acceptable credit terms for dealer to sell our cement in the market.
C210A	Service	Has a process to know the service level expectations of dealer from our organization in terms of response time; to announce price change, to announce discounts and to fulfill orders.

4.5.1.4 Measures for KM process to "Share" knowledge (KMPROSHR)

KM process to share knowledge is the internal ecosystem of the organization to percolate the knowledge acquired by individual employees of multiple functions across and within their own functions. This means, to augment existing knowledge base of the employees (Civi, 2000), transmit knowledge about customers across company (Forcadell & Guadamillas, 2002), sharing customer needs within the firm (Darroch & McNaughton, 2003), exchange of knowledge across functional boundaries (Chuang, 2004) and transfer learning about customers, products and services throughout organization (Zack et al., 2009). Keeping in view the construct identified from the literature review following questions were incorporated in questionnaire to understand the implications of sharing of KM process.

Table 4.8 Questions for KMPROSHR (included in questionnaire)

Code	Focus area	Statement
		My organization…
C21A	Channel	Has a process for sharing information about all cement dealers in my market with my peers, subordinates and superiors.
C22A	Inventory	Has a process for sales team to exchange information about cement required by our dealers in my market with our logistics team.
C23A	Transport	Has a process for logistics team to share the available capacity of various modes (Rail, Road and Sea) for cement dispatch within logistics team (Regional, Zonal, Plant and Central levels).
C24A	Sales Force	Has a process for sales team to share the identified cement projects in my market with peers, subordinates and superiors.
C25A	Advertising	Has a process for sale team to share the captured advertisement of our competitors with our advertisement team.
C26A	Sales Promotion	Has a process for sales team to share the sales promotion strategies of competitors with their peers, subordinates and superiors.
C27A	Price	Has a process for sales team to share daily market wise, dealer wise, product wise prices of cement per bag.
C28A	Discount	Has a process for sales team to share the cost benefit analysis of the acceptable discount per bag of cement with peers, subordinates and superiors.
C29A	Credit Terms	Has a process for sales team to share the cost benefit analysis of the acceptable credit terms for dealer to sell cement in the market with peers, subordinates and superiors.
C210A	Service	Has a process to communicate across relevant functions (marketing & sales, finance & accounts, logistics) the service level expectations of dealer from our organization in terms of response time; to announce price change, to announce discounts and to fulfill orders.

4.5.1.5 Measures for KM process to "Use" knowledge (KMPROUSE)

KM process to use knowledge is the ability of an organization to derive benefit of the shared knowledge to develop strategies to respond to the customer needs in the market. This has been referred by various authors as development of strategy to avoid internal knowledge loss and ensure that it could not be copied by competitors (Beckett et al., 2000), creates new knowledge to innovate (Forcadell & Guadamillas, 2002), creates new knowledge to be competitive (Chuang, 2004) and uses knowledge as the key element in strategic planning (Zack et al., 2009). Keeping in view the construct identified from the literature review following questions were incorporated in questions to understand the implications of use of KM process.

Table 4.9 Questions for KMPROUSE (included in questionnaire)

Code	Focus area	Statement
		My organization…
C21A	Channel	Has a process for using information about all cement dealers in my market to develop our dealer expansion strategy in my market.
C22A	Inventory	Has a process for logistics team to integrate cement required by our dealers in all the markets and develop a distribution plan.
C23A	Transport	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 the dealers in the market.
C24A	Sales Force	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.
C25A	Advertising	Has a process for our advertisement team to understand advertisement of competitors and develop new advertisement for our cement products.
C26A	Sales Promotion	Has a process for sales team to develop new and effective sales promotion strategy.
C27A	Price	Has a process for sales team to develop a market wise and product wise pricing strategy.
C28A	Discount	Has a process for sales team to develop a discount structure beneficial to both the dealer and my organization.
C29A	Credit Terms	Has a process for sales team to design credit terms beneficial to both the dealer and my organization.
C210A	Service	Has a process for relevant functions (marketing & sales, finance & accounts, logistics) to internally prepare for serving the expected service levels of dealers from our organization in terms of response time; to announce price change, to announce discounts and to fulfill orders.

4.5.1.6 Measures for KM process to "Apply" knowledge (KMPROAPP)

KM process to apply knowledge is finally the capability of organization to implement the developed strategies to respond to the customer needs in the market. This refers to responding to market with the developed strategies that were difficult to imitate by the

competitors (Darroch & McNaughton, 2003), enables companies with reference to change and thereby manage uncertain market environment (Berawi, 2004), deploy developed knowledge in such a way that it creates value for organization and provides an edge over competitors (Zack et al., 2009). Keeping in view the construct identified from the literature review following questions were incorporated in the questionnaire to understand the implications of apply of KM process.

Table 4.10 Questions for KMPROAPP (included in questionnaire)

Code	Focus area	Statement
		My organization…
C21A	Channel	Has a process to apply our dealer expansion strategy to expand our dealer network in my market.
C22A	Inventory	Has a process for logistics team to distribute cement as per developed distribution plan to our dealers in all the markets.
C23A	Transport	Has a process for logistics team to dispatch the cement through various modes (Rail, Road and Sea) as per cement dispatch plan.
C24A	Sales Force	Has a process for sales team to implement the developed marketing plan to promote cement in my market.
C25A	Advertising	Has a process for our advertisement team to respond with the new advertisement of our cement products.
C26A	Sales Promotion	Has a process for sales team to timely implement developed sales promotion strategy.
C27A	Price	Has a process for sales team to respond to market with the developed product wise pricing strategy.
C28A	Discount	Has a process for sales team to announce the developed discount structure in the market.
C29A	Credit Terms	Has a process for sales team to announce the designed discount structure in the market.
C210A	Service	Has a process to actually fulfill the expected service levels of dealers from our organization in terms of response time; to announce price change, to announce discounts and to fulfill orders.

4.5.1.7 Measures for Competitive Advantage (CA)

In organizations initiatives are taken with a desired intent of having a positive business impact, be it tangible or intangible. As per the available research the initiatives that pertains to KM are taken with an intent to create a positive impact on the organization largely in terms of competitive advantage, innovativeness and financial performance. As per a study KM contributes to an organizations' ability to innovate and finally derive competitive advantage (Braganza et al., 1999). The KM initiatives broadly focuses on the process of identifying, organizing, transferring, and more efficiently using information and expertize within an organization to manage the increasing global competitive pressure (Civi, 2000). A theoretical study suggests that the organizations

could derive competitive advantage through internal knowledge transfer, but restricting it to competitors (Argote & Ingram, 2000). Efficient management of KM processes would help organizations to do a cost benefit analysis to manage scarce resources and thereby derive competitive advantage (Beckett et al., 2000). An empirical study suggests that the key contribution of KM is identified as the ability to innovate, improve coordination of efforts, rapid commercialization of new products, the ability to anticipate surprises, responsiveness to market change and reduced redundancy of information or knowledge (Gold et al., 2001). Another empirical research study analyzes the impact of KM enablers, KM processes on organization performance compared to competitors in terms of success, greater market share, faster growth, profitability, and innovativeness (Choi & Lee, 2003). A study explores possibility of positive relationship between KM capability and competitive advantage. In this study competitive advantage is measured in terms of innovation, barrier in the market for other companies, increasing product range without increasing the cost and difficulty for competitors to duplicate the KM capability (Chuang, 2004). A proposed quality value model through KM initiatives focuses on quality to increase all of products strength factors and at the same time minimize weaknesses to derive competitive advantage (Berawi, 2004). A case study of Invista provides the evidence that its KM systems that connects internal and external knowledge provides competitive advantage by differentiating its products against low cost substitutes (Danskin et al., 2005). In a study to link KM, competitiveness and economic performance the measures compared to competitors considered for competitiveness of organizations are – market share, growth, profits, innovativeness and its overall success (Andreeva & Kianto, 2012). This study focuses on deriving competitive advantage through KM practice and KM process, and has considered 5 key competitive advantages namely – market share, growth, profitability, innovativeness and responsiveness to market demand. Keeping in view the construct identified from the literature review following questions were incorporated in the questionnaire to understand the implications of KM on competitive advantage.

Table 4.11 Questions for CA (included in questionnaire)

Code	Focus area	Statement
		Competitiveness compared to our key competitors…
C71A	Market share	Our organization has a greater market share
C72A	Growth	Our organization is growing faster
C73A	Profitability	Our organization is more profitable
C74A	Innovativeness	Our organization is more innovative
C75A	Responsiveness	Our organization is more responsive to market demand

4.6 Validation of Questionnaire

The above consolidated questions from section 4.5.1.1 to 4.5.1.7 developed were shared and discussed with 8 experts – 5 from cement industry marketing function and 3 from academics to get the expert opinion on framing of question and addition of new construct, if any. The industry persons were from middle to senior management level with functional expertise in cement marketing, strategy, supply chain, IT and HR. And persons from academics had their research and teaching in the area of marketing and supply chain. The said discussion with 8 experts – was done face-to-face with 5 and 3 through phone calls. The average duration of interaction was about 30 minutes and the overall inputs received were largely to improve the sentence formation or appropriate wordings. All the eight experts conferred with broad constructs identified without any need for any other construct. However, to build greater clarity in the questions certain suggestions were received which were duly incorporated.

4.7 Pilot Study

The pilot study was carried out to ensure that survey questions operate well as well as the complete research instrument functions well (Bryman, 2012). A pilot study is a small research project wherein data is collected from the respondents in similar way that will be carried out for the main study (Zikmund, Babin, Carr, & Griffin, 2009). In literature there are two broad approaches identified for the pilot study – to carry out feasibility study as a preparation towards the main study and to pre-test the research instrument (Edwin Van Teijlingen & Hundley, 2002). The reasons to conduct the pilot study for this research were as under:

- To understand that the instructions for the respondents to fill the questionnaire are sufficient
- To identify, if there were any changes required in the flow of questionnaire
- To find the logistical problem in carrying out the study

The pilot study was carried out by sending the questionnaire to the 10 TSM's based in three states of India – Punjab, Uttrakhand and Chhattisgarh. The TSM's could complete the survey within 15 minutes, eight of them responded through email, one through post and one through web link. Those who responded through email actually took the print of the questionnaire, marked their response, scanned the response sheet and then emailed it back. The pilot study was thus carried out smoothly and laid the foundation for the administration of the final survey.

4.8 Administration of Survey Questionnaire for the Study

As explained in section 4.3, various techniques to administer the survey were discussed. Out of the survey techniques – internet and mail was used for this study to administer the survey. The survey for this study was carried out during April-September'2016. The survey questionnaire (Appendix IV) was sent to the respondents who were TSM's or their equivalent positions responsible for marketing and sales of cement through trade channel. It was sent through email with an attachment in MS word and as a web link. Their e-mail address was gathered through the address booklet published by Cement Manufacturers' Association of India and subsequent linkages were got from them. The population of TSM's employed in Indian cement companies responsible for sales through trade channel is estimated to be 962, which is almost 100% of the TSM population as explained in section 4.4.4. The respondents were requested to fill the questionnaire and send it back in three ways -

- word using pen, scanning it and sending it as an attachment
- word using pen and sending it through post and
- using the web link

The respondents were assured of confidentiality and that their responses will be used for research purpose only. A regular gentle-reminder through email and phone calls was made to increase the response rate.

4.8.1 Response collection

A total of 130 questionnaires were received, of which 120 were found to be valid and complete for study, which corresponds to a response rate of 12.47% (120/962). This response rate is considered to be reasonable for this study, especially keeping in view the intense competition and recent norms of Competition Commission of India, cement marketing professionals are usually reluctant to share their views and data pertaining to their company. This response rate is also comparable to a study carried out to understand the KM practices in Indian manufacturing organizations wherein the response rate was 12%, that is out of the 625 survey questionnaires that were sent to the respondents 71 complete responses were received (Singh et al., 2006).

4.9 Tools and Techniques for Data Analysis

In the present business environment there is no dearth of information but there is lack of knowledge (F.Hair, Black, Babin, & Anderson, 2017; Peters, 1988). Some of the information can be analyzed and understood with simple statistics, but much of it requires more complex, multivariate statistical techniques to convert these data into meaningful outcomes from deeper and statistical analysis(F.Hair et al., 2017). The established and emerging techniques of multivariate analysis are – principal components and common factor analysis, multiple regression and multiple correlation, multiple discriminant analysis and logistic regression, canonical correlation analysis, multivariate analysis of variance and covariance, conjoint analysis, cluster analysis, perceptual mapping, correspondence analysis, structural equation analysis and confirmatory factor analysis (F.Hair et al., 2017).

The purpose of this research was to study the linkage between KM and CA for understanding this linkage multivariate statistical technique known as structural equation modelling (SEM) was used. SEM is a family of statistical models that seek to explain the relationship among multiple variables. It estimates a series of separate, but interdependent, multiple regression equations simultaneously by specifying the structural model used by the statistical program. In this the researcher draws upon theory, prior experience, and the research objectives to distinguish which independent variables predict each dependent variable. Dependent variables in one relationship can

become independent variables in subsequent relationships, giving rise to the interdependent nature of structural model (F.Hair et al., 2017). The previous empirical studies (Andreeva & Kianto, 2012; Lee & Choi, 2003) have also used SEM to analyze similar linkages. Researchers are attracted to SEM because it provides a conceptually appealing way to test a theory. If a researcher can express a theory in terms of relationships among measured variables and latent constructs, then SEM will assess how well the theory fits reality represented by data (F.Hair et al., 2017).

The three important characteristics of SEM are (F.Hair et al., 2017) :

- Estimation of multiple and interrelated dependence relationships
- An ability to represent unobserved concepts in these relationships and account for measurement error in the estimation process
- Defining a model to explain the entire set of relationships

The analysis was carried out by performing – 1. Exploratory Factor Analysis (EFA) and 2. Confirmatory Factor Analysis (CFA) that includes development of measurement model and structural model. Both EFA and CFA have different purpose, EFA is to summarize the information contained in a number of original variables into a smaller set of new, composite dimensions or factors with a minimum loss of information and CFA to provide confirmatory test to the measurement theory. Out of the total sample of 120, EFA was carried out with the first half of the data (sample size: 60) and CFA was carried out on the second half of the data (sample size:60) (Arun & Jyoti, 2017; F.Hair et al., 2017).

In the subsequent section the steps taken in the study by using tools and techniques for identifying relative importance of variables with a view to identify less important and not so important variables, normality of the data, assessment of reliability and validity, and fit indices were undertaken in the study are discussed.

The tools and techniques used in the study are discussed in subsequent sections.

4.9.1 Tools and Techniques prior to EFA and CFA

This section describes importance index, normality assessment, reliability assessment and item analysis, and validity assessment which are pre-requisites before carrying out EFA and CFA.

Importance index analysis

The importance index of indicators was calculated for each variable in the questionnaire based on the formula below (A. Digalwar & Sangwan, 2011; K. Digalwar, R. Tagalpallewar, & K. Sunnapwar, 2013). The indices developed for each variable provide the relative importance of the variables in the listed questionnaire.

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

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 the variable is important and lower value not important. The indices have been categorized as under:

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

Above categorization helps to understand relative importance given to the questionnaire by the respondents.

Normality assessment of the sample data

The most widely used estimation methods in SEM assume multivariate normality. Many instances of multivariate normality are detectable through inspection of univariate distributions (Kline, 2005). There are quite a few available estimation methods such as – Ordinary Least Squares (OLS), Weighted Least Squares (WLS), Generalized Least Squares (GLS) and Maximum Likelihood Estimation (MLE) methods. The MLE is the most efficient and unbiased when the balance of multivariate normality is met (F.Hair et al., 2017). 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 values of Skewness and Kurtosis is 2 and 7 respectively to assess normality (Mîndrila, 2010).

Reliability assessment and item analysis

Reliability is the degree to which the observed variable measures the "true" value and is "error free", even if the measure is repeated (F.Hair et al., 2017). In order to measure the reliability, internal consistency analysis was performed on the variables under each construct. The common statistic used for this measurement is Cronbach co-efficient alpha. The rule of thumb for reliability estimate is that Cronbach coefficient alpha > 0.7 suggest good reliability and between 0.6 and 0.7 is acceptable (F.Hair et al., 2017).

The next analysis after reliability carried out was to conduct a detailed item analysis to decide whether an item is to be deleted or retained. For the total of seven constructs the item analysis was carried out. The analysis covered interpreting inter-item correlation matrix, corrected item-total correlation and Cronbach alpha to decide whether an item (variable) is to be retained or deleted. Inter-item correlation suggests the way the particular item relates to other item. In practice with an average inter-item correlation of 0.20 for a test length of 10 or more items it is possible to realize a Cronbach alpha of 0.71 (Ferketich, 1991; Zeller & Carmines, 1980). The high corrected item-total correlation for an item, indicates better is the item and corrected correlations above 0.30 are generally good (Ferketich, 1991; Nunnally, 1978).

Validity assessment

Validity is the extent to which a scale or set of measures accurately represents the concept of interest (F.Hair et al., 2017). It means how well the intended variable measures what it is supposed to measure (K. Digalwar et al., 2013; Litwin & Fink, 1995). The two types of validity generally considered are content and construct (K. Digalwar et al., 2013).

Content Validity -The factor analysis provides helpful evidence about the measures that are intended to have content validity, which is largely based on opinion of various users (Nunnally, 1978). It is not evaluated numerically but subjectively judged by researchers (K. Digalwar et al., 2013).

Construct Validity - It is the extent to which a set of measured items (variables) actually reflects the theoretical latent construct of items which are designed to measure. Thus, it deals with the accuracy of measurement (F.Hair et al., 2017). To determine the construct validity, factor analysis is usually carried out (Flynn, B.B., Schroeder, R.G. and Sakakibara, 1994; K. Digalwar et al., 2013; Nunnally, 1978; Saraph, Benson, & Schroeder, 1989).

KMO (Kaiser-Meyer-Olkin)-In order to apply factor analysis on the constructs it is important to first examine the strength of the relationship among the variables. The literature suggests three measures of sampling adequacy; Correlation matrix, Bartlett's Test of Sphericity and KMO to determine the strength of relationship among the variables (A. K. Digalwar & Sangwan, 2007; Nunnally, 1978). For a good factor analysis, 0.60 is the minimum value of KMO (Pallant, 2016).

4.9.2 Tools and Techniques for EFA and CFA

This section deals with the factor analysis and fit indices which are used to develop the final SEM model.

EFA (Exploratory Factor Analysis) and CFA (Confirmatory Factor Analysis)

Factor analysis - To conduct the factor analysis on the variables under each construct, the principal component analysis with varimax rotation was performed using statistical computing package SPSS 16 for windows. For each construct this analysis was performed and number of components extracted in each analysis was determined for Eigen value greater than one. The total variance explained was analyzed with varimax rotation on all the 7 constructs. The variance is a value that represents the total amount of dispersion of values for a single variable about its mean. This variance explains how much of a variable's variance is shared with other variables in that factor (F.Hair et al., 2017).

Fit indices for MM (Measurement Model) and SM (Structural Model)

For a proposed model, Goodness of Fit (GOF) compares the estimated covariance matrix and the observed covariance matrix. The value of any GOF measure is the outcome of a mathematical comparison of these two matrices. The closer the value of these two matrices better is the model fit (F.Hair et al., 2017). The GOF measure can be classified into three categories – absolute fit indices, incremental fit indices and parsimony indices. Researcher should report at least one incremental index and one absolute index, in addition to Chi-square (χ^2) (F.Hair et al., 2017).
The three fit indices considered for this study are GFI, CFI and χ^2/df, which are described below:

Goodness-of-Fit Index (GFI): This fit index is classified under the absolute fit index category. This is relatively old fit static and is less sensitive to sample size. The possible range of GFI is between 0 and 1 (F.Hair et al., 2017). Traditionally, a cut-off point of 0.90 (Hooper, Coughlan, & Mullen, 2008) is recommended for GFI, however when factor loading and sample size is low a higher cut off of 0.95 is recommended (Hooper et al., 2008; Shevlin & Miles, 1998).

Comparative Fit Index (CFI): This fit falls under incremental fit indices category and is a revised version of normed fit index (NFI) which takes into account sample size (Byrne, 1998; Hooper et al., 2008) and performs well when sample size is small (Hooper et al., 2008; Tabachnick & Fidell, 2007). The CFI value above 0.90 is an indicator that the model is fit (F.Hair et al., 2017).

χ^2/df: The chi-square (χ^2) test falls under absolute indices category. There is a limitation with this when the sample size is large it rejects the model and when sample size is low it may not discriminate between good fitting models and poor fitting models. Due to this limitation, the ratio χ^2/df as an alternate has been proposed as a better approach (Hoe, 2008; Joreskog & Sorbom, 1986). There is no consensus on the ratio of χ^2/df but recommended ratios are between the range of 2:1 and 3:1 (Hooper et al., 2008).

4.10 Conclusion

This chapter has presented the rationale for the research design and methodology adopted for this study to examine empirically the proposed theoretical model. The process of development of the questionnaire and estimation of population of the TSM's which is the unit of analysis was discussed in detail followed by the process of administering the survey. Subsequently, the data analysis techniques namely EFA and CFA used for this study were discussed. Based on the methodology presented in this chapter the next chapter deals with analysis of data to arrive at findings with a view to test the hypotheses framed and their implications for cement industry to derive competitive advantage through KM pertaining to marketing and sales function.