

CHAPTER 5

RESEARCH METHODOLOGY

ABSTRACT

This chapter delineates the empirical study on determining training needs of frontline managers at power distribution companies (DISCOMs) in central India. The research problem has been stated followed by research questions and research objectives. The operating definitions for the present study are also included in this chapter along with the details on the pilot study. Various tests and their results establishing instrument validity and data reliability are also included in detail in this chapter. The chapter concludes with research process flow chart.

5.1 INTRODUCTION

This is an empirical study on the training needs assessment of frontline managers at power distribution companies (DISCOMs) in central India. The study included primary and secondary data. The secondary data has been sourced from the internet, electronic access to official journals, research publications, websites; reports published by the institutions like - World Bank, ADB, CEA, SEB, DISCOM etc.

The data for present the study has been collected from the managers of DISCOMs in central India for the purpose of present study. The details of these respondents as per their designation in the power distribution company hierarchy are as follows:

1. Middle Managers: The middle managers in power distribution company under study include - Additional Chief Engineer, Superintending Engineer, Additional Superintending Engineer, Executive Engineer, and equivalent.
2. Frontline Managers: The frontline managers in power distribution company under study include - Additional Executive Engineers, Assistant Engineer, Junior Engineer, and equivalent in the field.

5.2 STATEMENT OF THE RESEARCH PROBLEM

The statement of Research Problem is as under:

“Identification of training issues to be incorporated at the organisation-task-person level for training needs assessment (TNA) of frontline managers at DISCOMs.”

5.3 RESEARCH QUESTIONS

Research questions came up on the basis of the critical analysis of theme based research gaps. These are as follows:

1. What are the organisational level factors which affect frontline managers’ training at DISCOMs in central India?
2. What are the task level factors which affect frontline managers’ training at DISCOMs in central India?
3. What are the person level factors which affect frontline managers’ training at DISCOMs in central India?

5.4 RESEARCH OBJECTIVES

The theoretical premise (Table 5.1) has led to following research objectives for the present study:

1. To analyse the training needs of DISCOMs’ frontline managers at organisational level.
2. To analyse the training needs of DISCOMs’ frontline managers at task level.
3. To analyse the training needs of DISCOMs’ frontline managers at person level.

Table 5.1: Research Gaps leading to Research Objectives

Research Gaps	Research Questions	Research Objectives
1. The reforms in Indian power sector have brought in new technologies, therefore there is a need to find out which are the technologies on which the competency of frontline managers need to be upgraded.	1. What are the organisational level factors which affect frontline managers' training at DISCOMs in central India?	2. To analyse the training needs of DISCOMs' frontline managers at organisational level.
2. The reforms in Indian power sector have emphasized power distribution companies to take the customer oriented commercial approach. There a need for study to find out on which customer services the front line managers need upgradation.	2. What are the task level factors which affect frontline managers' training at DISCOMs in central India?	3. To analyse the training needs of DISCOMs' frontline managers at task level.
3. The job-description of middle managers include appraising the performance and determining training needs of frontline managers working under them. There is a need to find reasons for performance gaps by analysing training needs of frontline managers at O-T-P level in the power distribution companies. Thus, there is a need to find out if there any significant difference of opinion between middle managers and frontline managers with regard to O-T-P analysis for TNA.	3. What are the person level factors which affect frontline managers' training at DISCOMs in central India?	4. To analyse the training needs of DISCOMs' frontline managers at person level.

5.5 OPERATING DEFINITIONS

When collecting data, it is essential that everyone in the system has the same understanding and collects data in the same way. Operational definitions should therefore be made before the collection of data begins. Any time data is being collected, it is necessary to define how to collect the data. Data that is not defined will usually be inconsistent and will give an erroneous result. It is easy to assume that those collecting the data understand what and how to complete the task. However, people have different opinions and views, and these will affect the data collection. The only way to ensure consistent data collection is by means of a detailed operational definition that eliminates ambiguity (PQS, 2016). Therefore, clear and detailed definition or operational definition to data collection of the measure used in the study is as follows:

1. **Power Distribution Company (DISCOM):** All the power distribution companies operating in central India namely, Madhya Pradesh Eastern Region Power Distribution Company (MPERPDC); Madhya Pradesh Central Region Power Distribution Company (MPCRPDC); Madhya Pradesh Western Region Power Distribution Company (MPWRPDC); and Chhattisgarh State Power Distribution Company Limited (CSPDCL) are taken for the purpose of present study.
2. **Frontline Managers:** Frontline managers in DISCOMs are the field officers mainly Assistant Engineers and Junior Engineers posted in the operations and maintenance office in the towns, sub-urban and rural areas. They act as an inter-face between the power distribution companies and their customers (Parvatiyar and Sheth, 2002). The job description of frontline managers at power distribution companies relevant to present study includes following roles and responsibilities: ensuring reliable power supply, attending system faults, providing new services, upgrading services, billing, metering, system maintenance, system upgrading, providing constructive feedback to customers, theft detection, revenue recovery, and educating customers on different government schemes.

3. **Middle Managers:** Middle managers in DISCOMs are the Executive Engineers and Superintending Engineers to whom frontline managers report. The job description of middle managers at power distribution companies relevant to present study includes finding the training needs by analysing frontline managers' performance at Organisation-Task-Person (O-T-P) levels. The details of what to analyse at these three levels is as follows:

i. **Organisational level:** The organisational level items for determining training needs of frontline managers for the purpose of this study (Table 5.2) are arranged as under.

Table 5.2: Organisational items

S. No.	Organisational Items	Abb.
1	Support of superiors despite change in environment.	O1
2	Antagonize by colleagues & superiors	O2
3	Management has a clarity on training	O3
4	Trainings match groups' / individuals' job demand	O4
5	Learned skills often not supported at workplace	O5
6	Non-availability of resources & tasks to use training	O6
7	Well planned training with enough budget.	O7
8	Networking possibilities to interact & share skills.	O8
9	Pressures from political groups to change decisions	O9
10	Pressures from union / peers to change decisions.	O10

ii. **Task level:** The task level items for determining training needs of frontline managers for the purpose of this study (Tables 5.3 and 5.4) are arranged under technical and commercial headings for the ease of understanding and analysis. These are as follows:

Table 5.3: Task items – Technical

S. No.	Task items – Technical	Abb.
1	Assessing change in customers' monthly electricity consumption in the last few years.	T01
2	Assessing increase in customers' expectations for services from DISCOM in last few years.	T02
3	Advising and educating customers adequately on the different categories and slabs of electricity tariffs.	T03
4	Advising and educating customers adequately on the penalties for indulging in theft of electricity.	T04
5	Advising customers adequately on the disadvantages of having low power factor in their installation	T05
6	Advising customers adequately on the disadvantages of having unbalanced load in their installation	T06
7	Advising customers adequately on the benefits of using energy efficient appliances in their installation	T07
8	Advising customers adequately on their electrical installation and any shortcomings in that.	T08
9	Educating customers adequately on the safety issues related to their installation.	T09
10	Advising customers adequately on energy efficiency measures in their installations.	T10
11	Educating customers on the role of Bureau of Energy Efficiency and other Government schemes for them.	T11
12	Being equally commercial in your approaches as they are technical at work.	T12
13	Put enough efforts to increase DISCOM's revenue.	T13
14	Possess skills to promptly resolve customers' services and bills related grievances.	T14
15	Put enough efforts to reduce supply outage in your area.	T15

16	Capable enough to identify customers' issues and conclude as much as possible from info available.	T16
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Table 5.4: Task items – Commercial

S. No.	Task Items – Commercial	Abb.
1	Advising and educating customers adequately on responsibilities of electricity customer	T17
2	Being sensitive in dealing with customers and refraining from any kind of unpleasing behaviour.	T18
3	Putting an effort to improve the lethargic attitude of your staff to ensure quality services to customers.	T19
4	Understanding customers' needs and expectations.	T20
5	Demonstrating trust and empathy in listening to customers' facts and understand feelings.	T21
6	Being adequately motivated and professional to make DISCOM progress and serve customers better.	T22
7	Reflect creativity in your work in understanding and resolving customers' problems.	T23
8	Being capable of positively influencing customers to be a loyal and responsible customer of DISCOM.	T24
9	Have unbiased approach towards customers and show genuine interest in them.	T25
10	Track customers' pending grievances / issues and follow up enough to address them.	T26
11	Good communication and public relations skills to perform frontline manager's job at DISCOMs.	T27
12	Being cost conscious enough in your work and providing services to customers	T28
13	Capable to develop deep collaborative relations between DISCOM and customers to create a win-win situation	T29

14	Try to build DISCOM a customer friendly company with good image in general public.	T30
15	Have team spirit and fellowship at your workplace to serve customers better.	T31
16	Thorough and precise in approaching DISCOM's work and your personal activities?	T32

iii. **Person level:** The person level items for determining training needs of frontline managers for the purpose of this study (Tables 5.5, 5.6., and 5.7) are arranged under Knowledge, Skills, and Abilities (KSA) headings for the ease of understanding and analysis. These are as follows:

Table 5.5: Person items (Knowledge)

S. No.	Person Items (Knowledge)	Abb.
1	Setting and calibration of modern digital relays.	P01
2	Understanding benefits of distributed generation and promoting it in remote areas.	P02
3	Undertaking simulation study in medium and low voltage networks using power system software.	P03
4	Installing right switchgears at right location in the system.	P04
5	Identify work related issues and draw as much conclusion possible from the given information.	P05
6	Anticipating short and long term consequences of FLMs' actions and decisions.	P06
7	Strong understanding of various tariffs, surcharges, and penalties in-force.	P07
8	Quality numerical and analytical reasoning for higher performance.	P08
9	Tracking progress and quality of work of the team to achieve effective output.	P09
10	Understand financial procedures & practices to monitor malpractices.	P10

11	Understanding internal audit practices and setting procedures for compliance.	P11
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Table 5.6: Person items (Skills)

S. No.	Person Items (Skills)	Abb.
1	Undertaking technical investigation if same fault reoccurs in same area/feeder.	P12
2	Reconfiguring network using utility software for improved technical solutions.	P13
3	Aligning staff, designing work, and allocating tasks to achieve DISCOMs' goals	P14
4	Having strong commitment towards respecting rules and work ethics.	P15
5	Using utility related software for commercial solutions and maximizing revenue.	P16
6	Developing need based templates / programs for commercial and other works.	P17

Table 5.7: Person items (Abilities)

S. No.	Person Items (Abilities)	Abb.
1	Investigating feeder wise energy consumed and energy billed.	P18
2	Assessing commercial and technical losses in the system	P19
3	Promoting demand side management on DISCOM side.	P20
4	Promoting demand side management at customers' end	P21
5	Promote energy efficiency measures in the system.	P22
6	Making unbiased judgment in addressing stakeholders' grievances.	P23
7	Demonstrating trust and empathy, listening to facts, and understand customers' feelings.	P24
8	Identifying tasks, assess their importance, and prioritise them to get better	P25

	results.	
9	Breaking old habits without or less support for new skills and behaviours at workplace	P26
10	Influencing others in a way that results in acceptance, agreement, or behaviour change.	P27
11	Loyalty towards DISCOM in preparing it to make a positive difference in the future.	P28
12	Resolving work place conflicts and ensuring a cordial working environment.	P29
13	Quick decision making and working out amicable solutions for unforeseen.	P30
14	Providing constructive feedback to stakeholders and showing interest in them.	P31

4. **Training Needs Assessment:** It is done at three levels. These levels are - organizational analysis, task analysis and person analysis. In short, it is abbreviated as O-T-P model for TNA (Miller & Osinski, 2002; McGehee and Thayer, 1961). For the purpose of this study, Training Needs Assessment refers to analysing training needs of DISCOMs' frontline managers on the identified organisation, task and person items (Table 5.1 to 5.7) at the organisational level, task level, and person level. The concise definition of the organisational analysis, task analysis and person analysis is as follows:

i) Organisational Analysis: It is to analyse the performance of frontline managers by their reporting middle managers on organisational items for consideration of - company's environment, strategic company directions, and resources; to determine where to emphasize training (Noe, 2005; McGehee and Thayer, 1961).

ii) Task Analysis: It is to analyse the performance of frontline managers by their reporting middle managers on technical and commercial tasks. Task analysis is the analysis of activities to be performed in order to determine technical and commercial competencies needed (Brown, 2002).

iii) Person Analysis: Person analysis is to analyse the performance of frontline managers by their reporting middle managers on their current knowledge, skills, and abilities; to ascertain who needs training and what kind of training (Warshauer, 1998).

5.6 SAMPLING PROCEDURES

5.6.1 Target population

This study is focussed on the power distribution company at central India. There are four power distribution companies located in central India and all four are included in this study. These are -

- Madhya Pradesh Eastern Region Power Distribution Company (MPERPDC)
- Madhya Pradesh Western Region Power Distribution Company (MPWRPDC)
- Madhya Pradesh Central Region Power Distribution Company (MPCRPDC)
- Chhattisgarh State Power Distribution Company (CSPDC)

5.6.2 Sampling element

Sampling element is the object about which or from which the information is desired. It may be the respondents, products, stores, companies, families, or other. The sampling elements in this study are the managers at the power distribution companies under study.

5.6.3 Sampling unit

Sampling unit is the basis of the actual sampling procedure. It is that segment of the population actually chosen by the sampling process. The sampling unit may contain one or more population elements. That is, these units may be individual elements or aggregates of individual elements (Smith, Albaum, 2005). Each power distribution company manager whose response is included in this study constituted a sampling unit.

5.6.4 Extent

Extent refers to the geographical boundaries. The study was limited to the states of Madhya Pradesh and Chhattisgarh operating in a geographical area of 443338 sq. km of central India (around 13.5% of country's total geographical area).

5.6.5 Sampling technique

Stratified probability proportional to size (PPS) sampling was used. Table 5.8 shows managers at different management levels at the four DISCOMs under study.

Table 5.8: Different management levels at DISCOMs under study

S. No.	DISCOM	Total Employees	Middle Managers	Frontline Managers
1	MP Eastern Region Power Distribution Company	14174	174	589
2	MP Central Region Power Distribution Company	12110	185	602
3	MP Western Region Power Distribution Company	12915	164	649
4	Chhattisgarh State Power Distribution Company	10196	147	586
Total Population		49395	670	2426
Corresponding percentage			21.65 %	78.35%
Population of Middle Managers, and Junior Managers				3096
<ul style="list-style-type: none"> Note: 364 is the suggested sample size when the population is 4000 (Bartlett et al., 2001). Accordingly, the corresponding participation of respondents in the study: Middle managers: $(670/3132)*364= 78$ (rounded). Junior managers: $(2426/3132)*364= 282$ (rounded). Assuming to have 95% level of confidence and $\pm 5\%$ percent level of precision (generally used in social science researches). 				

Out of the total employees' strength of 49395, only 3096 managers at middle and frontline management levels were included in the study.

5.6.6 Sample size

Assuming to have 95% level of confidence and $\pm 5\%$ percent level of precision (generally used in social science researches), the Table 5.9 illustrates sample size of 364 when the size of population is 4000. Altogether 360 responses were collected.

Table 5.9: Sample Size

S. No.	Target Group	Number Participation
1	Middle Managers	$(670 / 3132) * 364 = 78$ (rounded)
2	Frontline Managers	$(2426 / 3132) * 364 = 282$ (rounded)
Total responses collected		360

5.7 INSTRUMENT DESIGN

5.7.1 Questionnaire development

A questionnaire was developed to use as a tool to gather data. The questionnaire statements were developed based on the two counts i.e., one, reflections of the experts from power distribution sector and the officials holding decisive position in the power distribution companies as presented in Chapters 1 and 2; two, the literature review included in Chapter 3 and Chapter 4. This instrument is then used in pilot study and validated. The questionnaire for the study contains four sections: the first section collects the demographic information of the respondents; second section collects information on the organisational items (10); while the third section is dedicated to collect information on the task items (32); and fourth on the person items (31), as shown in Table 5.10. The details of these sections are as follows:

Section A: For collecting demographic profile of respondents on; Respondents name, gender, age and qualification; name of the power distribution company where the respondent is presently employed; respondent's total work experience and his total service at power distribution company (s).

Section B: For collecting the response of middle managers and frontline managers on the organisational items. The middle managers' and frontline managers' responses were collected on the same organisational items to find if there is any significant difference between the opinions of middle managers and frontline managers in regard to organisational items.

Section C: For collecting the response of frontline managers on the technical and commercial task items. The middle managers' and frontline managers' responses were collected on the same task items to find if there is any significant difference between the opinions of middle managers and frontline managers in regard to task items.

Section D: For collecting the response of frontline managers on the person items - knowledge, skills, and abilities. The middle managers and frontline managers' responses were collected on the same person items to find if there is any significant difference between the opinions of middle managers and frontline managers regarding person items.

Table 5.10: Structure of questionnaire developed

Section	Purpose	Number of items	Respondents
A	Respondent's demographic profile	06	DISCOMs' frontline managers and middle managers
B	Organisational Analysis	10	
C	Task Analysis	32	
D	Person Analysis	31	

5.7.2 Scale formation

A scale was formed to measure the agreement of respondents on different items included in the questionnaire. Each item statement in the questionnaire was rated on a five-point Likert scale of agreement (on the continuum of Strongly Disagree to Strongly Agree). The reliability of the test

ranged between 0.7 and 0.9; the construct validity (content and criterion) of the instrument was established; explained in detail in point 5.10.

5.7.3 Hypothesis formation

Considering the objectives of the research, three centralized hypotheses were tested for determining training needs of the frontline managers by their immediate superiors, the middle managers at three levels - organisation, task and person. The centralised hypothesis I is tested for determining training needs of the frontline managers by the middle managers at the organisation level. The centralised hypothesis II is tested for determining training needs of the frontline managers by the middle managers at the task level. The centralised hypothesis III is tested for determining training needs of the frontline managers by the middle managers at the person level. These statements of the centralised hypothesis for the organisation analysis, task analysis and person analysis are as follows:

Hypothesis I

Null Hypothesis (H₀): *There is no significant difference of opinion between Middle Managers and Frontline Managers with regard to organisational analysis for TNA.*

Alternate Hypothesis (H₁): *There is a significant difference of opinion between Middle Managers and Frontline Managers with regard to organisational analysis for TNA.*

Hypothesis II

Null Hypothesis (H₀): *There is no significant difference of opinion between Middle Managers and Frontline Managers with regard to task analysis for TNA.*

Alternate Hypothesis (H1): *There is a significant difference of opinion between Middle Managers and Frontline Managers with regard to task analysis for TNA.*

Hypothesis III

Null Hypothesis (H0): *There is no significant difference of opinion between Middle Managers and Frontline Managers with regard to person analysis for TNA.*

Alternate Hypothesis (H1): *There is a significant difference of opinion between Middle Managers and Frontline Managers with regard to person analysis for TNA.*

5.8 PILOT TESTING

The questionnaire was pre-tested by undertaking a pilot study on 10% population of middle managers and frontline managers of power distribution companies under study to finalise the overall structure and statements of the items in the questionnaire.

5.9 INSTRUMENT RELIABILITY

5.9.1 Internal consistency - reliability

Cronbach's Alpha test was conducted and was calculated for data collected from middle managers (presented in Table 5.11).

**Table 5.11: Cronbach Alpha value (middle managers)
(N=78)**

	Cronbach's Alpha	N of items
Middle managers' response on	.701	10

organisational items.		
Middle managers' response on task items	0.905	32
Middle managers' response on person items	.713	30

Cronbach's Alpha value of the data collected from middle managers is acceptable confirming internal consistency (reliability) of the data. Acceptable Cronbach's alpha values range from 0.70 to 0.95 (Tavakol, Dennick, 2011).

Cronbach's Alpha test was conducted and was calculated for data collected from frontline managers (presented in Table 5.12).

**Table 5.12: Cronbach Alpha value (frontline managers)
(N=282)**

	Cronbach's Alpha	N of items
Frontline managers' response on organisational items	.725	10
Frontline managers' response on task items	0.905	32
Frontline managers' response on person items	.852	30

Cronbach's Alpha value for the data collected from frontline managers is acceptable confirming internal consistency (reliability) of data.

5.10 INSTRUMENT VALIDITY

Content validity is the degree to which items in an instrument reflect the content universe to which the instrument will be generalised (Straub et al, 2004). Content validity is generally established for the evaluation of a new instrument for data collection. This ensures that the

survey instrument prepared includes all the essential items and eliminates undesirable items within a particular construct's domain (Straub et al, 2004; Kitchenham and Pfleeger, 2002; Boudreau et al, 2001; Lewis, 1995;). Although there are two leading approaches that comprise judgements and statistics are available to determine content validity, their application is unique to each study (Emory and Cooper, 1991; Torkzadeh and Dhillon, 2002). The application of content validity differs in terms of when it is utilised, how it is conducted and the number of experts who evaluated the content. The judgement approach to establish content validity involves literature reviews followed by evaluation by expert judges or panels. The validation of the items is based on a high degree of consensus amongst expert panels or judges on the items in question; therefore, it is judgemental in nature (Straub et al, 2004; Torkzadeh and Dhillon, 2002; Kitchenham and Pfleeger, 2002; Boudreau et al, 2001; Storey et al, 2000; Smith, 1996; Moore and Benbasat, 1991; Davis, 1989;) The judgemental approach of content validity requires researchers to be with experts to facilitate validation. It is therefore, also sometimes known as 'face validity' (Wacker, 2004).

5.10.1 Face validity (Construct validity - content)

Face validity refers to whether a panel of judges or experts on the topic agree that the statements do relate to what they are supposed to measure. If agreement is obtained, then the instrument has face validity. A test has face validity if an examination of the items leads to the conclusion that the items are measuring what they are supposed to measure. So, asking people who have expertise and authority in the related field, about what they think about the test is face validity. Face validity is the easiest validation process to undertake but a weakest form of validity. It evaluates the appearance of the questionnaire in terms of feasibility, readability, consistency of style and formatting, and the clarity of the language used (DeVon et al. 2007; Trochim 2001; Haladyna 1999). Thus, face validity is a form of usability rather than reliability (Parsian, Dunning, 2009).

Face validity in this study was established to indicate if the questionnaire appeared to be appropriate to the study and its content area. To establish face validity of questionnaire framed, an evaluation form (Table 5.13) was developed to help respondents assess parameters below.

- i. The clarity of the wording of questions.
- ii. The likelihood the target respondents would be able to answer the questions,
- iii. The layout and style of the questionnaire.

Five middle managers and fifteen frontline managers of power distribution companies under study were randomly selected to respond to the evaluation form for the face validity on a Likert scale of 1-4, strongly agree= 1, agree= 2, disagree= 3, and strongly disagree= 4. In spite of face validity being the lowest form of validity, it was still useful in providing important information about the operationalisation of questionnaire by the managers.

Table 5.13: Face Validity Evaluation Form

S. No.	Criterion	Strongly agree	Agree	Disagree	Strongly disagree
1	Wording of statements has clarity.				
2	Respondents are likely to be able to answer.				
3	Layout and style of questionnaire is good.				

Result on face validity for Questionnaire:

Responses of 15 DISCOMs' frontline managers were collected on the evaluation form for the questionnaire. Distributions of responses are shown in Table 5.14. The Responses of 5 DISCOMs' middle managers were also collected on the evaluation form for the questionnaire. Distributions of responses are shown in Table 5.15

Table 5.14: Face Validity Evaluation Form - Frontline Managers' response

S. No.	critrion	Strongly agree	Agree	Disagree	Strongly disagree
1	Wording of statements has clarity.	14	1		

2	Respondents are likely to be able to answer.	12	3		
3	Layout and style of questionnaire is good.	13	2		

The respondents rated each criterion on, 1 (strongly agree) and on 2 (agree). On the ‘wording of statements has clarity’, 93% respondents indicated they understood the statements clearly. 80% believe that respondents will find them easy to answer. While, 87% respondents found the questionnaire’s layout and style is acceptable for target respondents.

Table 5.15: Face Validity Evaluation Form - Middle Managers’ response

S. No.	Item	Strongly agree	Agree	Disagree	Strongly disagree
1	Wording of questions has clarity.	4	1		
2	Respondents are likely to be able to answer.	5			
3	Layout and style of questionnaire is good.	5			

The respondents rated each criterion on either 1 (strongly agree) or 2 (agree). On the ‘wording of statements has clarity’, 80% indicated they understood the statements clearly. All the respondents found them easy to answer. Further, all the respondent found the questionnaire’s layout and style acceptable for target respondents.

5.10.2 Content Validity (Construct validity - content)

Lawshe (1975) introduced an empirical or quantitative approach of content validity. This approach involves estimating the statistical validity ratio (Lewis, 1995; Lawshe, 1975). It is not always possible to have many experts of a particular research topic at one location, which was the case in this research. Contrastingly, a quantitative approach allows researchers to send content validity questionnaires to experts working at different locations; therefore, distance is not

a problem faced by research. In order to perform content validity for training needs assessment (TNA) research, a quantitative approach was also considered along with a judgemental approach.

The content validity of the questionnaire was performed employing a quantitative approach (Lawshe, 1975; Lewis et al, 1995) through following steps to validate the content of constructs.

1. Relevant items from the existing literature on training needs assessment (TNA), and discussions with top managers and independent power sector professionals were identified. This led to the construction of questions and the content validity questionnaire.
2. A content evaluation panel, consisting of experts from power sector who were knowledgeable on frontline managers' training needs, was selected.
3. Each expert in the panel was provided with the questionnaire. The experts were requested to respond independently to each item in relation to a particular construct on a three-point scale where: "1= not necessary", "2= useful but not essential" and "3=essential".
4. The responses received from all experts were then compiled. The responses indicating "essential" for each item were counted.
5. The content validity ratio (CVR) for each item was estimated utilising the formula $CVR = [(n - (N / 2)) / (N / 2)]$ (Lawshe 1975), where N is the total number of respondents and n is the frequency count of the number of experts rating the item as "3=essential".
6. Finally, the CVR value of each item was examined for its significance employing the standard table provided by Lawshe (1975). If the estimated CVR value is equal to or above the standard value, then only the item is accepted; other-wise it is rejected. The significance level (standard value) depended upon the number of experts rating the item.

The above steps were followed to evaluate the items under different sections included in the questionnaires. A sample of statements included under organisation items, task items, and person

items on determining training needs of Front line managers were identified from the reflections of the experts and officials at decisive position in the power distribution companies. In total there were: 10 organisational items, 32 task items, and 30 person items. Content validity questionnaires were then prepared which comprised the identified O-T-P (10-32-30) items on a scale of 1-3 where, 1 stands for Essential, 2 stands for Useful but not necessary and 3 stands for Not necessary.

A total of 12 power sector experts were identified on the basis of their experience and availability to participate with erstwhile SEBs (four experts) or with lately formed DISCOMs (eight experts). The questionnaire was sent to these experts along with the purpose of the study and guidelines to respond to the questionnaire items. The experts were asked to rate each item in relation to the different constructs on a three-point scale: "1 = not necessary"; "2 = useful but not essential"; "3 = essential". They were also requested to provide additional comments (if any) on understanding of items, or any new items to be added. Responses received from the experts were collated by counting the numbers of ratings that indicated "essential" for each item.

CVR was then estimated and evaluated for a statistical significance level of 0.05 by means of Lawshe's (1975) method. This process was undertaken for each item included in the questionnaire. Entries with significance level < 0.05 were eliminated. Tables from 5.16 to 5.18 represent the estimated Content Validity Ratio value.

Table 5.16: Content Validity Ratio of Organisation Items

Organisation item	N	3	2	1	n	Mean	CVR
O1	12	12	0	0	12	3	1
O2	12	12	0	0	12	3	1
O3	12	11	1	0	11	2.92	0.83
O4	11	11	1	0	11	2.92	0.83
O5	12	12	0	0	12	3	1
O6	12	12	0	0	12	3	1

O7	12	12	0	0	12	3	1
O8	12	12	0	0	12	3	1
O9	12	12	0	0	12	3	1
O10	12	12	0	0	12	3	1

Legend: N = Experts completed content validity questionnaire, n = Experts rated items as essential, $CVR = [(n - (N / 2)) / (N / 2)]$

Table 5.17: Content Validity Ratio for Task Items

Code	N	3	2	1	n	Mean	CVR
T01	12	10	2	0	10	2.83	0.67
T02	12	10	2	0	10	2.83	0.67
T03	12	12	0	0	12	3	1
T04	12	11	1	0	11	2.92	0.83
T05	12	12	0	0	12	3	1
T06	12	11	1	0	11	2.92	0.83
T07	12	12	0	0	12	3	1
T08	12	12	0	0	12	3	1
T09	12	12	0	0	12	3	1
T10	12	12	0	0	12	3	1
T11	12	12	0	0	12	3	1
T12	12	10	2	0	10	2.83	0.67
T13	12	12	0	0	12	3	1
T14	12	11	1	0	11	2.92	0.83
T15	12	12	0	0	12	3	1
T16	12	10	2	0	10	2.83	0.67
T17	12	12	0	0	12	3	1
T18	12	12	0	0	12	3	1
T19	12	12	0	0	12	3	1

T20	12	11	1	0	11	2.92	0.83
T21	12	11	1	0	11	2.92	0.83
T22	12	12	0	0	12	3	1
T23	12	10	2	0	10	2.83	0.67
T24	12	10	2	0	10	2.83	0.67
T25	12	11	1	0	11	2.92	0.83
T26	12	12	0	0	12	3	1
T27	12	11	1	0	11	2.92	0.83
T28	12	11	1	0	11	2.92	0.83
T29	12	10	2	0	10	2.83	0.67
T30	12	12	0	0	12	3	1
T31	12	11	1	0	11	2.92	0.83
T32	12	11	1	0	11	2.92	0.83

Legend: N = Experts completed content validity questionnaire, n= Experts rated items as essential, $CVR = [(n - (N / 2)) / (N / 2)]$

Table 5.18: Content Validity for Person items

Code	N	3	2	1	n	Mean	CVR
P01	12	12	0	0	12	3	1
P02	12	12	0	0	12	3	1
P03	12	12	0	0	12	3	1
P04	12	10	2	0	10	2.83	0.67
P05	12	12	0	0	12	3	1
P06	12	11	1	0	11	2.92	0.83
P07	12	12	0	0	12	3	1
P08	12	12	0	0	12	3	1
P09	12	12	0	0	12	3	1
P10	12	12	0	0	12	3	1
P11	12	12	0	0	12	3	1

P12	12	12	0	0	12	3	1
P13	12	12	0	0	12	3	1
P14	12	12	0	0	12	3	1
P15	12	10	2	0	10	2.83	0.67
P16	12	11	1	0	11	2.92	0.83
P17	12	11	1	0	11	2.92	0.83
P18	12	11	1	0	11	2.92	0.83
P19	12	12	0	0	12	3	1
P20	12	12	0	0	12	3	1
P21	12	12	0	0	12	3	1
P22	12	12	0	0	12	3	1
P23	12	12	0	0	12	3	1
P24	12	12	0	0	12	3	1
P25	12	12	0	0	12	3	1
P26	12	12	0	0	12	3	1
P27	12	12	0	0	12	3	1
P28	12	12	0	0	12	3	1
P29	12	11	1	0	11	2.92	0.83
P30	12	10	2	0	10	2.83	0.67
P31	12	10	2	0	10	2.83	0.67

Legend: N = Experts completed content validity questionnaire, n= Experts rated items as essential, $CVR = [(n - (N / 2)) / (N / 2)]$

Table 5.19 summarises the CVR derived from Tables 5.16, 5.17, and 5.18. The findings presented in these tables confirmed that majority of experts considered all the organisational items (10), task items (32), and person (31) items for determining training needs of frontline managers important and recommended to include all of them in the questionnaire (the CVR value is significant at 0.05 level).

Table 5.19: Content Validity Ratio Summary (organisation, task, and person items)

CVR	Organisation items	Task items	Person items
0.90 – 0.99	8	15	22
0.80 – 0.89	2	10	5
0.70 – 0.79	0	0	0
0.60 – 0.69	0	7	4
0.50 – 0.59	0	0	0
0.40 – 0.49	0	0	0
0.30 – 0.39	0	0	0
0.20 – 0.29	0	0	0
0.10 – 0.19	0	0	0
0.00 – 0.09	0	0	0
Total	10	32	31
R.L.H.	0	0	0
Grand Total	10	32	31

Legend: *= Not Significant, R.L.H.= Items that rated essential by less than half participants,

Table 5.20 shows the overall items, average CVR and average mean for the items to be included in the questionnaire.

Table 5.20: Construct Validity (organisational, task, and person items)

S. No.		Total items	Significant items	Average Content Validity Ratio	Average Mean
1	Organisation items	10	10	0.96	2.98
2	Task items	32	32	0.87	2.94
3	Person items	31	31	0.92	2.96

The average CVR value for all items ranged between 0.96 and 0.87 at the 0.05 level of statistical significance. CVR can measure between -1.0 and 1.0. The closer to 1.0 the CVR is, the more

essential the object is considered to be (Ndangurura, 2015). The results illustrated that the data collection instrument possess a high level of content validity, which means that all items were representative of a construct universe and to be included in the questionnaire.

5.10.3 Convergent Validity (Construct validity - criterion)

Convergent validity of organisation items, task items, and person items in the questionnaire was established using data reduction technique. Reliability and adequacy test were also conducted. Table 5.21 shows the components extracted in pattern matrix for organisational items.

Table 5.21: Convergent validity (Organisation items)

Organisation items	Component				
	1	2	3	4	5
O9	.937				
O10	.929				
O4		.929			
O3		.782			
O6		.527			.519
O1			.898		
O5			.885		
O7				.866	
O8				.842	
O2					.890

Average loading and variance extracted of each component of organisation analysis.

Components Extracted	Average Loading	Variance Extracted
----------------------	-----------------	--------------------

Component 1	.933	.870489
Component 2	.746	.556516
Component 3	.8915	.794772
Component 4	.854	.729316
Component 5	.704	.496320

Average loading of all extracted components is greater than the minimum acceptable value of 0.7 (Hair, Anderson, Tatham, Black, 1998) suggesting convergent validity for all extracted components in the organisational analysis.

Table 5.22 shows the components extracted from viewpoints of frontline managers and middle managers in pattern matrix for task items.

Table 5.22: Convergent validity (Task items)

Task Items	Component			
	1	2	3	4
T26	1.069			
T31	.875			
T11	.837			
T22	.833			
T21	.801			
T20	.783			
T25	.682			
T07	.643			
T08	.625			
T19	.554			
T05	.551			

T18	.500			
T16		.916		
T12		.872		
T29		.735		
T30		.665		
T15		.598		
T17		.536		
T23				
T27				
T28				
T02				
T01				
T04			.919	
T14			.866	
T10			.833	
T09			.800	
T13			.790	
T03			.778	
T06			.610	
T24				.848
T32				

Average loading and variance extracted of each component.

Components Extracted	Average Loading	Variance Extracted
Component 1	0.729417	0.532049

Component 2	0.720333	0.51888
Component 3	0.799429	0.639086
Component 4	0.848	0.719104

Average loading of all extracted components is greater than the minimum acceptable value of 0.7 (Hair, Anderson, Tatham, Black, 1998) suggesting convergent validity for all extracted components in the task analysis of the questionnaire.

Table 5.23 shows the components extracted in pattern matrix for person items.

Table 5.23: Convergent validity (Person items)

Person items	Component							
	1	2	3	4	5	6	7	8
P01	.813							
P02	.668							
P03								
P04	.930							
P05	.894							
P06	.687							
P07	.794							
P08	.675							
P09	.675							
P10			.587					
P11						.913		
P12						.575		
P13						.681		
P14			.865					

P15			.953					
P16		.519						
P17				.734				
P18							.894	
P19		.777						
P20				.644				
P21					.769			
P22							.554	
P23					.811			
P24								.694
P25				.707				
P26				.732				
P27		.807						
P28		.919						
P29		.923						
P30				.540	.585			
P31								.764

Average loading and variance extracted of each component.

Components Extracted	Average Loading	Variance Extracted
Component 1	0.780142	0.608622
Component 2	0.789	0.622521
Component 3	0.801666	0.642669
Component 4	0.7054	0.497589
Component 5	0.721666	0.520802
Component 6	0.723	0.522729

Component 7	0.724	0.524176
Component 8	0.729	0.531441

Average loading of all extracted components is greater than the minimum acceptable value of 0.7 suggesting convergent validity for all extracted components in person analysis.

5.10.4 Discriminant validity (Construct validity - criterion)

Discriminant validity is determined by demonstrating that a measurement does not correlate very highly with another measure. Discriminant validity can be verified when the average variance extracted for each construct is greater than the square of correlations between a given construct and all other constructs (Fornell and Larcker, 1981). As indicated in the Table 5.24, the variance extracted between all components of organisational items is greater than the correlation square between them; hence discriminant validity has been established for organisational analysis in the questionnaire.

Table 5.24: Discriminant Validity (organisation items)

	Component	1	2	3	4	5
	1					
Correlation		.026				
Correlation ²	2	.000				
Var. Extracted		.7135				
Correlation		.028	.245			
Correlation ²	3	.000	.060			
Var. Extracted		.8326	.6756			
Correlation		.022	.049	.134		
Correlation ²	4	.000	.002	.017		
Var. Extracted		.7999	.6429	.7620		

Correlation		.076	.090	.173	.086	
Correlation ²	5	.005	.008	.029	.007	
Var. Extracted		.6834	.5264	.6455	.6128	

Table 5.25 shows the correlation, correlation square, and variance extracted between task items components.

Table 5.25: Discriminant Validity (task items)

	Component	1	2	3	4
	1				
Correlation		.676			
Correlation ²	2	.457			
Var. Extracted		0.5254			
Correlation		.362	.316		
Correlation ²	3	.131	.099		
Var. Extracted		0.5855	0.9223		
Correlation		.208	.291	.158	
Correlation ²	4	.043	.084	.025	
Var. Extracted		0.6255	0.6189	0.6790	

As seen in Table 5.25, the variance extracted between all components is greater than the correlation square between them (Fornell and Larcker, 1981), hence discriminant validity has been established for task analysis in the questionnaire.

Table 5.26 shows the correlation, correlation square, and variance extracted between person items components.

Table 5.26: Discriminant Validity (person items)

	Component	1	2	3	4	5	6	7	8
	1								
Correlation		.295							
Correlation ²	2	.087							
Var. Extracted		.6155							
Correlation		.283	.242						
Correlation ²	3	.080	.058						
Var. Extracted		.6256	.6325						
Correlation		.344	.449	.325					
Correlation ²	4	.118	.201	.105					
Var. Extracted		.5531	.5600	.5710					
Correlation		.290	.192	.316	.235				
Correlation ²	5	.084	.036	.099	.055				
Var. Extracted		.5647	.5716	.5817	.5091				
Correlation		.384	.372	.278	.309	.106			
Correlation ²	6	.147	.138	.077	.095	.011			
Var. Extracted		.5656	.5726	.5826	.5101	.5217			
Correlation		.007	.044	.182	.010	.031	.063		
Correlation ²	7	.000	.001	.033	.000	.000	.003		
Var. Extracted		.5663	.5733	.5834	.5108	.5224	.5234		
Correlation		.378	.277	.079	.174	.215	.352	.063	
Correlation ²	8	.142	.076	.006	.030	.046	.123	.003	
Var. Extracted		.5700	.5769	.5870	.5145	.5261	.5270	.5278	

As seen in Table 5.26, the variance extracted between all components is greater than the correlation square between them (Fornell and Larcker, 1981); hence discriminant validity has been established for person analysis in the questionnaire.

5.11 DATA COLLECTION AND TABULATION

Administering questionnaire

A criterion for successful questionnaire is maximisation of the response rate. The researcher used several ways of administering questionnaire that can help in achieving this (Dillman et al. 2009). He also stressed the value of questionnaire, confidentiality of responses, and a courteous request for their cooperation. He gave enough time to prepare the respondents and impress upon them that his questionnaire is important and their responses will be dealt in confidentiality. Throughout the response collection period, the researcher maintained contact with his targeted respondents to get maximum response rate to achieve a successful study and overall response.

Data Collection

The responses collected through questionnaire were chequered for their completeness. The complete responses were transferred to excel file for analysis. For the ease of analysis codes and categories were allotted to questionnaire items and responses.

5.12 DATA ANALYSIS TOOL

The sample size of the two target groups of respondent middle manager and frontline manager was not same. The non-parametric tests can be used when the sample sizes of the study groups are unequal (McHugh, 2013). In such cases when the sample size of respondent groups varies invariably, the best data analysis tool is Chi-square test (Man et al. 2000). Thus Chi-square test is used for testing the hypothesis using SPSS software.

Chi-square test: In the chi square tests, the null hypothesis makes a statement concerning how many cases are to be expected in each category if this hypothesis is correct. The chi square test is based on the difference between the observed and the expected values for each category.

$$\chi^2 = \sum_i \frac{(O_i - E_i)^2}{E_i}$$

Here O_i is the observed number of cases in category i , and E_i is the expected number of cases in category i . This Chi-square statistic is obtained by calculating the difference between the observed number of cases and the expected number of cases in each category. This difference is squared and divided by the expected number of cases in that category. These values are then added for all the categories, and the total is referred to as the Chi-square value (Gingrich, 2004).

5.13 RESEARCH PROCESS FLOW CHART

The flowchart of research process is represented in figure 5.1

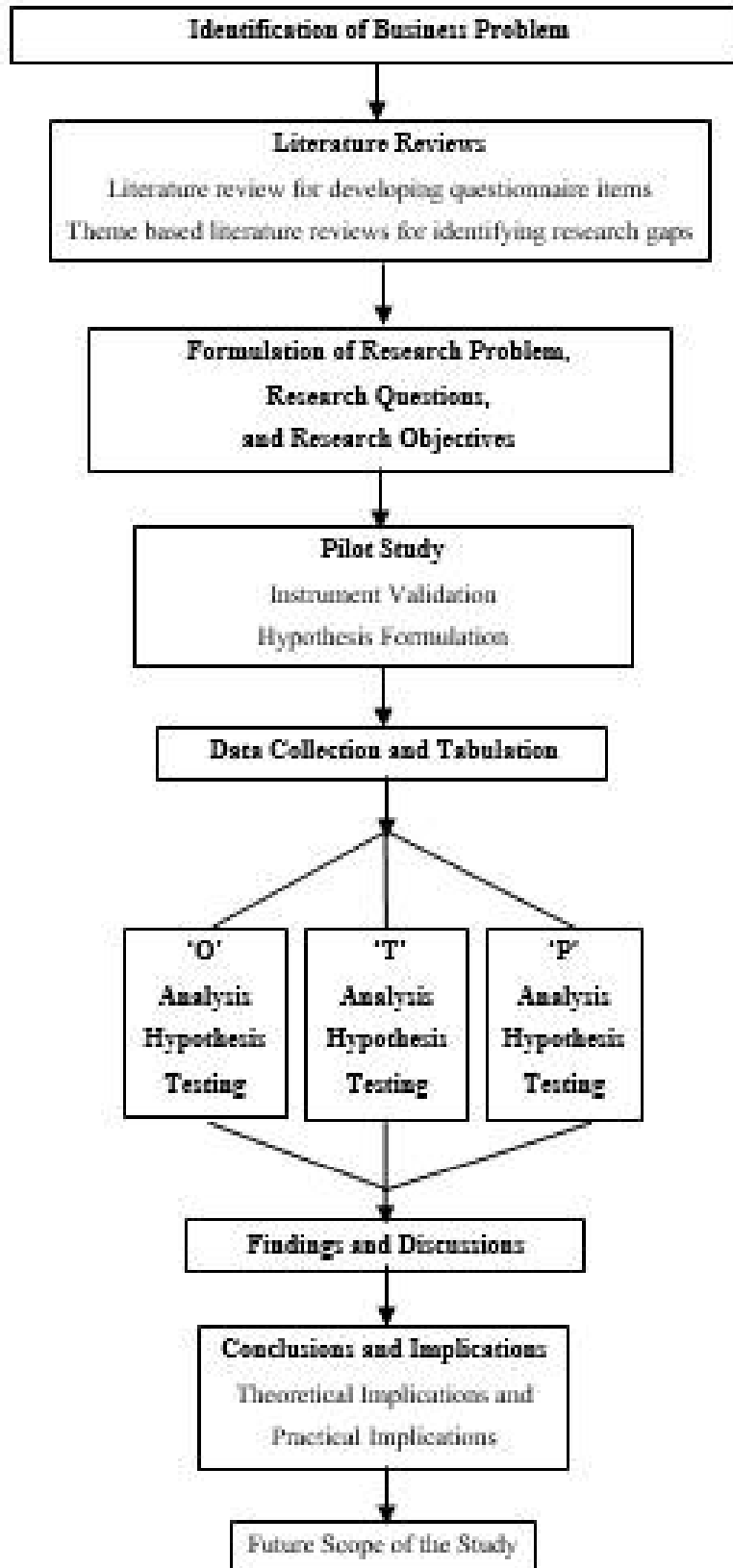


Fig. 5.1: Research Process Flowchart

5.14 SUMMARY

1. The research problem of the study is, 'Identification of training issues to be incorporated at the organisation-task-person level for training needs assessment (TNA) of frontline managers at DISCOMs'.
2. Three research questions came up as an outcome of critical analysis of theme based research gaps. These are: What are the organisational level factors which affect frontline managers' training at DISCOMs in central India?; what are the task level factors which affect frontline managers' training at DISCOMs in central India?; and what are the person level factors which affect frontline managers' training at DISCOMs in central India?
3. The three research objectives corresponding research questions were- to analyse the training needs of DISCOMs' frontline managers at organisational level; to analyse the training needs of DISCOMs' frontline managers at task level; and to analyse the training needs of DISCOMs' frontline managers at person level.
4. Operational definitions of power distribution company (DISCOM), frontline manager, middle manager, training needs assessment, organisational analysis, task analysis, and person analysis have been clarified.
5. The data collection instrument validity and reliability is expounded.
6. The Justification of using Chi-square test as the data analysis tool for unequal sample sizes of target groups is explained in the chapter.
7. The research process flow chart indicates the steps in the research process with methodologies used at different stages.
8. The next chapter presents the analysis of the data and discussion on the findings.