9 RESEARCH METHODOLOGY AND DATA ANALYSIS –
OBJECTIVE 3

9.1 Research Methodology

Qualitative research includes ethanography, phenomenology, biography, case study
and Grounded theory. Ethanography comprises of studying cultural groups which are
unbroken. This study is done in their natural setting and over long periods. Phenomenology comprises identifying core human experiences. This is normally
captured as described by the participants. Biography as the name suggests allows the
individuals to describe the stories of their life. Thus in essence it studies the life of
people. Case study explores the unique characteristics of one or many individuals
relating to a program or an activity.

In contrast, the grounded theory takes views of participants to develop a theory,
constantly update and revise the theory as the views of participants evolve and
converge. Thus, any theory so derived is grounded in view of the participating
individuals.
(Creswell J., 1998).

We found that the grounded theory was the most appropriate for the research since:

- The purpose of this study is to generate a conceptual framework than can explain a
  process. Since experts in the area are limited, grounded theory was best suited for
  this research (Patton Q. M., 2002).
- It aids the deduction and explanation of phenomenon by answering socially
  purposeful questions of what is happening here and why (Douglas, 2004)
- Gas market is an area where the knowledge is restricted to few individual and not
  much is known. Grounded theory will help bring a new perspective to this area of
developing gas markets (Goulding, 1999)
The grounded theory methodology is built by (Corbin & Strauss, 1998), and (Charmaz K., 2006), after its two original authors Barney Glaser and Anselm Strauss split post disagreement on the way to implement this theory. However, originally the theory was built on the premise that the theories which existed in research were often inappropriate for research where interactions with people was important and data should be continuously collected and vetted in the field.

As per Strauss and Corbin (1998), the researcher, normally follows a methodical analytical process to develop theory. In their later work, Corbin and Strauss to an extent and Charmaz sought to reclaim Grounded theory from its ‘positivist underpinning’ to interpretive.

As per Strauss and Corbin (1998), Grounded theory is just not a methodology for analyzing data, but has its own heart and understanding i.e. – it is a way of thinking about data and how it and its analysis are influenced by the environment in which it is generated.

Grounded theory centers on an area of study, collects and analyzes data using systematic processes like theoretical sampling and coding (Glaser & Strauss, The discovery of grounded theory, 1967); (Corbin & Strauss, 1998); (Charmaz K., 2006); (Creswell, J W, 2007). Data gathered is continued until saturation occurs i.e. no new information about topic is found. Data are examined using a constant comparison method that involves initial coding.

Figure 23, provides a schematic represents of the process of Grounded Theory as devised by Bitsch, 2005. This includes deciding on a problem. This is also the stage where the conceptual lens is identified to answer the question of developing a framework for development of efficient gas markets in India. This is followed by data collection and theoretical sampling, followed by coding and analysis. Once theoretical saturation is reached the theory development concludes. The researcher has adopted this method along with Grounded theory method and concepts proposed by Charmaz, Corbin & Strauss and Creswell.
9.1.1 Sampling

The participants were chosen by way of initial sampling followed by theoretical sampling. Initial sampling is done based on existing knowledge on experts in the field being researched and the objective set to be achieved. Initial sampling is done before the first interview is started.

(Charmaz K., 2006)
Theoretical sampling is decided based on emerging concepts once the initial set of interviews are done. Often the person being interviewed, himself suggest names of other experts to help uncover ideas in certain new dimensions. Theoretical sampling gets decided also based on emerging themes, ideas or concepts which will help maximize the chances of developing the required theory. (Corbin & Strauss, 2008).

In her book, constructing grounded theory Charmaz (2006, p.189) defined theoretical sampling as a method where the researcher aims to further develop/clarify the emerging categories. This is done by seeking fresh information from people or events.

As per Corbin and Strauss (1998), the participants in the study should have experienced the process. Since development of gas markets is a very specialized subject, therefore the sample of this study consisted of top officials from oil and gas Industry, senior government functionaries, big consultants working in the area, and regulators. As the study progressed the participants were theoretically sampled based as per the question/concepts that arose from the data.

Sampling procedures of qualitative research differ from those of quantitative research – they are based on concept of theoretical sampling rather than statistical sampling (Corbin & Strauss, 2008). Expressing their views on sample size, Corbin and Strauss (2008) explained that while using qualitative research the issue is not whether the sample is representative of a large population. If effect the researcher looks for variation in ideas and concepts and not similarities. Once the variations stop emerging the saturation is supposed to have been reached.

Therefore, in Grounded theory, size of sample is determined through theoretical sampling, achieved through constant comparison of emerging categories. Grounded theory approach suggests saturation as the criteria to apply to the emerging categories. Glaser (1992, 1998), argued that the only criteria for sampling is checking for saturation. Even if the sample is very small and saturation is reached, the researcher needs to stop new sampling.
As per Charmaz (2006), when after gathering new data and or interviewing new people do not throw fresh insights into categories being developed, saturation is assumed to be reached in gathering data.

In the study on the creating the framework for an efficient gas market nothing new appeared in the eight interview (with the head of a consulting organization), from the content prospective, indicating a theoretical saturation (Glaser and Strauss, 1967). However saturation (theoretical) is a notion that fits with positivist ontology based on one reality. From the prospective of constructive ontology, the possibility of another researcher arriving at a different conclusion cannot be ruled out.

Although the saturation of data was reached at the eight interviews, one more interview was conducted to triangulate the data with an expert in an oil & gas company working at the CEO position. Now new ideas or concepts emerged at this stage indicating that saturation is reached and data triangulated.

9.1.2 Data Collection Method

In grounded theory, analysis of data continues along with the collection of data. (Glaser & Strauss, The discovery of grounded theory, 1967). This indicates an iterative process with constant comparison between data collection based on theoretical sampling, rather than a linear process where data analysis begins when data collection is complete. However, for proving clarity to the readers, this research follows a positivist paradigm and present literature upfront followed by methods and then findings.

(Corbin & Strauss, 2008) have provided in grounded theory the researcher should be using unstructured interview which help in collecting maximum data, therefore unstructured interviews were used to collect data form the participants. If a researcher enters the field with a structured questionnaire, participants will answer only that which is asked, and often without elaboration. The participants might have other information to offer, which they don’t share fearing that they might disturb the research process (Corbin, J; Morse, J, 2003).
A pre-decided protocol was kept ready to help navigate the interview; it included the interview style, procedure and general rules to be followed. As per Patton (1990), the objective of such studies is best met using open ended questions and keeping the topics/areas flexible. Though a few initial questions are asked, the wording of the question is not predetermined & the focus of the enquiry gets evolved with the interviews (Patton M., 1990).

9.1.3 Interview Protocol

The initial set of questions were drawn from the conceptual lens. The list is provided below

- Which factors will help in development of efficient gas market?
- Which factors are more important than others?
- Among these factors how do you rate factors which are more important for market development?
- You are talking of [X, Y or Z] as key pillars. What follows this, i.e once this is in place what needs to be done.
- How does the factor contribute to development of gas market?
- What should be the priorities of GoI / Regulator
- How is India different from US, UK and EU markets.
- At what stage the regulator should start unbundling of transportation and marketing activities?
- How government should go about incentivizing pipeline in absence of demand?
- Do you think land and labour reforms are important for the market development?
- How many years it will take for development of gas markets in India

Probing questions were asked to have detailed insight into the subject being probed. Some key probing questions are provided below
Could you elaborate…?, What contributed to ?, How...?, Tell me more...?, Could you throw more light on...?, Is this also the factor…. ?, Is this also important ……

There is a set procedure which was followed for each interview. The main steps are outlined below

- Introduction
- Giving background Information- narrating the study and the purpose of it.
- Promising confidentiality
- Asking for concern and permission
- Putting the first mandatory question.
- Putting probing questions
- Asking further leading and probing questions
- Asking for something they wish to tell or know more.
- Asking for lead, and checking whether the participant is comfortable letting his name used.
- Thanking for the support

In any interview, there are some key rules which were followed as provided below
- Informing the participant about the topic and process
- Ensuring that the place of interview be comfortable enough for the participant to share information.
- Making a point to paraphrase the responses for capturing the thoughts of the participant correctly and checking your understanding.
- Transcribing the interviews immediately after the interviews are done.
- Checking for saturation levels

9.1.4 Data Analysis

Data analysis helps researchers get a handle to massive data, reduce its volume, capture emerging patters and generating framework for communicating what data the tells. The process of analysis in Grounded theory may begin while the data are being gathered, and immediately after the interviews are transcribed.
The study used constant comparison method at each stage of the analysis, at first compared data with data to identify similarities – it compared concepts, categories and ideas within the same interview and then compares them in different interviews. The statement and incidents that seemed conceptually similar were given the same code.

The analysis of the data was supported using qualitative analysis software Atlas.ti. Atlas.ti helped in coding, linking codes and text segments, creating memos, searching, revising and reorganizing. It also helped in visual display of data and findings (Creswell, J W, 2007).

9.1.5 Coding

Coding, an essential element to the formation of grounded theory. The concept of coding uses raw data to draw out concepts and theories (Corbin & Strauss, 2008). Coding consist of providing short labels to each set of data which helps in summarizing and analyzing the data (Charmaz K., 2006).

Grounded theory coding occurs in the following stages

1. Initial code / Open code
2. Focused / Selective code
3. Axial code
4. Theoretical code

(Charmaz K., 2006)

In Initial coding as many ideas are generated inductively from the transcripts as possible. In focused coding, the initial codes which are important and contribute more to the analysis are selected and elevated to the level of categories. In axial coding, relationship among categories with its subcategories is specified. In theoretical coding, possible relationship among the final concepts is specified.

In this study, the first two stages, helped to identify factors for development of gas markets and the final two stages helped in linking these factors in a sequence to help
provide a step by step framework for development of gas markets. This framework was then compared with the conceptual lens.

**Initial / Open Coding**

Initial coding also known as open coding had been described by Corbin & Strauss (2006) as breaking each sentence or part of sentence of data, which are then provided names/codes signifying an idea or concept.

This study resulted in 380 initial codes, adopting the guidelines of Charmaz (2006) as mentioned below

- Line by line initial coding was done.
- The attempt was made to stick close to the data.
- The words and actions of the participants were used in the codes to preserve the fluidity of their experience.
- Actions were seen in each data segment, which was unique to itself.
- Endeavor was made to code words that reflect action, hence coding was done with gerunds (Glaser, Theoretical sensitivity, 1978)

![Figure 24: Initial coding sample](image-url)
Figure 24 depicts application of all the above concepts in forming initial codes. This is one of the sample initial code output from Atlas Ti

**Focused / Selective Coding**

Focused coding
Focused or selective coding is done post the open codes are in place. While in initial codes data is segregated, focused coding is a stage when codes with certain conceptual basis are developed. (Glaser, Theoretical sensitivity, 1978). It requires identification of the initial codes and classifying them into categories. (Charmaz K., 2006).

The study merged together the codes with common features to create conceptual categories (Strauss & Corbin, 1990). The consolidation made it possible to reduce the 380 initial codes into 25 focused codes. To achieve this researcher, sift through the data, moved across the interviews and compared the categories. The example of focused codes are, supply side factors, Demand side factors, Infrastructure factors etc.

The early categories were kept provisional in line with the Grounded Theory to remain open to ensuing analytic possibilities. The constant comparison method resulted into many initial categories revised and re-revised.

**Axial Coding**

In focused coding, data generated is divided into categories. Out of these categories certain categories will be subcategories of a category. Axial coding helps in linking categories to its sub-categories so that the data is available for interpretation in a more meaningful way.

(Strauss A., 1987), sees axial coding as a method to build relationships between categories. However, this research uses Charmaz way of developing sub categories of a category to show a link between them and not the paradigm model consisting of conditions, actions, inactions and consequences as advocated by Strauss and corbin.
The study used axial coding to integrate categories with sub categories like supply side factor as a category to its subcategories which help the supply side factors like many suppliers, many sources of supply and competitive supply to name a few. Figure 25 depicts one such axial coding. Similarly factors like policy directive, demand side factors, regulatory interventions and market forces were used to link to their subcategories.

**Figure 25: Axial coding output from Atlas Ti**

![Axial coding output from Atlas Ti](image)

**Theoretical Coding**

Theoretical coding uses the codes generated during focused coding and linked them in axial coding. **Glaser (1978: 72)** introduce the word conceptualizing while working on theoretical codes. This means that at this stage the researcher works to link all the substantive codes into a theory. Thus this stage provides relationship between broad categories that have been developed in the previous stages (Charmaz K., 2006).

Theoretical code is like an umbrella that covers and accounts for codes and categories before the stage of theoretical coding (Saldana, 2010).

In this study the focused codes are integrated and organized into a logical emerging framework to help creating and efficient gas market in India. Timelines are also integrated while linking these categories. Figure 26 depicts a theoretical coding
Figure 26: Theoretical coding output from Atlas Ti

Outputs of coding can be viewed in Annexure 3
10 DISCUSSION ON FINDINGS, CONTRIBUTION TO LITERATURE & PRACTICE, RESEARCH LIMITATIONS AND FUTURE WORK

10.1 Discussion on findings

A new modified conceptual lens emerged from the outcomes of the grounded theory. The categories emerged were compared with the conceptual lens.

It was found that many of the categories matched that of the conceptual lens.

Policy Directives, Wellhead price freedom, Incentivize development of infrastructure, Open access, phased market opening, remove distortions from power and energy markets, breakup of monopoly, gas release program, capacity release program, transparency and development of hubs and energy security measures.
Some new got created

Fiscal and tax incentives, state laws, labour and land reforms, sustainable demand, low competition to push infrastructure, development of regional hubs, regulatory interventions, storage at RLNG terminals and energy security if gas assumes a good double-digit share in energy basket.

Some did not appear in the same form

Multiple supply came with a rider of competitive supply sources, real requirement of regulatory body was felt only after development of infrastructure. While international gas markets took decades to develop, it was envisaged that the Indian gas market can take shape on 15 years based on learning from international markets

Table 17 provides the summary of all categories when compared with the conceptual lens

<table>
<thead>
<tr>
<th>Matched categories</th>
<th>New categories</th>
<th>Modified categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Policy directives</td>
<td>• Fiscal and tax incentives</td>
<td>• Competitive supply source (along with multiple supply)</td>
</tr>
<tr>
<td>• Wellhead price freedom</td>
<td>• State laws</td>
<td>• Delay in requirement of regulator</td>
</tr>
<tr>
<td>• Incentivise infrastructure development</td>
<td>• Labour and land reforms</td>
<td></td>
</tr>
<tr>
<td>• Open access</td>
<td>• Sustainable demand</td>
<td></td>
</tr>
<tr>
<td>• Phased market opening</td>
<td>• Low competition in infrastructure</td>
<td></td>
</tr>
<tr>
<td>• Remove energy market and end user market distortions</td>
<td>• Development of regional hubs</td>
<td></td>
</tr>
<tr>
<td>• Break monopoly postions</td>
<td>• Regulatory interventions</td>
<td></td>
</tr>
</tbody>
</table>
• Gas release program
• Capacity release program
• Transparency
• Development of trading hubs
• Energy security measures

| • Storage at RLNG terminals for energy security |

10.2 Framework for creating efficient gas market

Based on the modified conceptual lens, and taking into considerations the new categories brought forward by qualitative analysis using grounded theory, the framework for creating an efficient gas market in India is represented in figure 28.

As discussed above the framework is unique for India since many categories got added which has a unique relationship with the Indian conditions. The Framework for development of efficient gas market is discussed in detail below. For simplicity and ease of understanding the framework has been divided into broad five phases depending upon the time horizon

• 0-3 years – Planning / Monopoly phase
• 3-10 years – Build / Growth phase
• 11-12 years – consolidation phase
• 13-15 years – Market development phase

Each of these phases are discussed below to understand the framework for creating an efficient gas market in India

1) Planning / Monopoly Phase (0-3 years):

This is a phase when government should come out with a clear and integrated energy policy for the gas and energy sector. The policy should provide a directional statement of what role the government of India wants gas to play in the energy mix. This is the
first basic requirement for gas economy to kick start. In absence of such directive the
investors don’t get the signals for making the desired investments. Coupled with the
policy statement, the government should also bring out clear policy directives for
various segments of the oil and gas chain from upstream to downstream. The policy
framework needs to be stable in the medium term including fiscal and tax structure so
that market has absolute clarity of returns on their investment. This is important unlike
other countries since very often we have witnessed structural changes without
grandfathering which hurts the investor sentiment, since he cannot project his returns.
In addition to the role of centre, the states in India need to play an important role in the
policy formation with respect to land and labour (being state subjects) and ensure that
it is easy to do business. A potential solution is single window clearance and ease in
laws to enter and exit business.

2) Build / Growth Phase: Partial Monopoly and start of market opening (3-10
years)

The next phase requires absolute focus on four core elements for gas industry to build
and grow

a) Creating and promoting multiple and competitive supply sources
b) Creating a demand which is sustainable and can absorb gas at reasonable market
prices.
c) Create infrastructure to connect this demand and supply
d) Ensure ease of doing business
The difference between gas and any other commodity market is that gas requires huge investment both in connecting with the market and for storage. Storage can be in the pipelines or in the cryogenic tanks of regas terminals. Natural cavers if they exist can be an additional source of storage. All these investments are large with high gestation periods before returns can be made. This may require the government to invest heavily in the sector since returns are not lucrative for private investors in part of the gas chain. Also, in the pipeline sector, the government needs to provide monopoly status to the sector to protect returns.

Any opening up of the sector at this stage when infrastructure is marginally developed will lead to erosion of returns which in turn will turn away risk capital.

In addition, during this stage the government should remove any price or allocation distortions from the gas market i.e. allow freedom to price gas at the wellhead and have single price of gas in the market both from new and old fields. All this will yield little results unless the state and central government work on ease of doing business, which includes reforming land and labour laws and fast track clearance for setting up business.
3) Consolidation Phase: Wholesale Market development / Partial retail market (11-12 yrs)

During this phase, regulatory capacities need to be built for the regulator to start intervening in the market. This requires recruiting right resources and acquiring right capabilities. Regulations would be required to set tariffs for monopoly business and later breaking up of the monopoly positions if required. The role of regulator is to create Pseudo competition in absence of market.

In addition to this the market should be opened in phased manner with the following actions

a) Open access should be provided on gas infrastructure with option of case to case exemption
b) Choice to customers should be provided for large volumes – wholesale competition
c) Gas allocation provided to bulk supplier should be release with contractual liability taken over by government. This will open up supply side competition.
d) Energy market distortions from power and fertilizer (the main gas consuming sectors) need to be removed for competition

In addition to the above this is the stage when some part of markets like western markets in India would be matured enough to start development of regional trading hubs. This also helps advance the learning curve for a pan India hub. A potential regional hub could be the western market of Gujarat and Maharashtra which are more mature than the other regions of India in terms of gas infrastructure, supply and demand.

4) Market Development Phase: Full Retail Competition (13-14 years)

During this phase the regulator pushes for full market opening, where in, many regulatory interventions are required
1) Unbundling of supply and marketing

b) Network codes required at this stage to deal with open access as well as capacity release and trading in pipelines

c) Merchant RLNG terminals need to be encouraged

d) Transparency in declaration of capacity, availability and demand of gas becomes key since information asymmetry has been the bane for any market.

e) Independent transmission system operators can be appointed at this stage

Open access norms and access code helps in increasing competition, but the bundled entities, work to ensure there are operational hurdles, thus frustrating the attempt to create competition. If this were to happen, which has been the experience in most markets, the regulator need to unbundle supply and marketing to push for competition. This measure works since if a owner of pipeline has tariffs as its only earning they tend to attract more players to utilize their capacity to increase utilisation.

National trading hubs should be developed starting with physical trading and followed by financial trading.

5) Fully developed market phase (15th Year)

Once full competition is established in the market it is expected that the share of gas in the energy basket would be in the range of 10-15%. Since India is not endowed with excellent upstream acreages, a large part of gas would be imported. This brings with it the additional risk of energy security, in case of any geo-political unrest. To deal with this countries having high percentage of gas in the energy mix resort to 30-60 day’s storage to deal with disruptions. However India needs to embark on this path only if gas attains a significant (at least 15%) share in the energy mix. During this phase the role of regulator is to monitor the market for any monopoly behaviors.

However, in the interim, to take care of energy security, India should develop low cost storage, which can be line pack in the large pipeline network as well as building additional storage tanks at the RLNG terminals.
While India has followed few elements from each stage, the regulators and governments have failed to follow a systematic approach, which is provided in the framework.

10.3 Contribution to Literature and Practice

Contribution to Literature

This research provides a step by step framework for development of efficient gas market in India. The current available literature is either for countries which have developed gas markets or provide solutions for a segment of gas sector in India. However, no researcher has provided a comprehensive step by step framework for addressing all the issues for development of gas markets, including the timeline in which to implement the same. This research attempts to fill this gap.

The framework provides two outcomes: one, it provides issues to be resolved or addressed to develop the market and two, the timelines and sequence in which to address / resolve the same. This is a major addition to literature in this sector.

This research will enrich the International understanding on development of gas market in developing economies, bringing in special Indian context including factors like

✓ Regulatory competence
✓ Development of sustainable demand
✓ Tax and fiscal incentives
✓ Competitive supply
✓ Land and labour reforms
✓ Ease of doing business
✓ Development of regional hubs to expedite market opening

These factors as outlined in the research were not existent or not relevant for the mature markets even when they were in developing phase.

Each country is unique and India is no exception, hence the international best practices cannot be applied to India as it exists. There must be unique features to the Indian
market, which this research is attempting to address. Sustainable demand means demand at a price point which the Indian consumer can afford and use in a long run. Similarly, tax incentives play a large role in India since India does not have large natural resources and has to depend on expensive imports. Tax and fiscal incentives help develop sustainable markets. Similarly ease of doing business is unique to Indian market

Energy sector and therefore the gas sector is unique in terms of how to liberalize. As seen in the proposed framework for creating the gas market any liberalization has to be preceded by proper pre-liberalization process to develop and stabilize the sector before opening up. The current issue is that the Indian government and the regulators in a hurry to open the market have missed the pre-liberalization phase which has impacted infrastructure creation in the last 4-5 years.

Gradualist approach would be best suited for gas sector due to political compulsions. Globalisation should be restricted based on the availability of the key resource for the country’s population

**Contribution to Practice and Business:**

Governments, regulators and business can use this framework getting additional insights to develop markets so that more gas is available as a clean and affordable fuel. Initially the government needs to play a key role in providing a basis on which the regulators can build the structure which is sustainable and workable for the Indian conditions.

Since the framework provides guidance on step by step approach along with indicative timelines, the, framework would guide decision makers to approach phase wise development of market and move to next phase only when key steps of last phase are achieved

Increased availability of clean and cheap energy which would help India to supply energy to its 1.3 billion population at affordable prices as well as meet its emission targets during the economic growth phase.
10.4 Quality of Research and Validity

Quality and Validity of research is important and needs to be addressed for users of the research to be comfortable with the outputs.

Researchers have traditionally called for objectivity / reliability and generalizability / validity to judge the quality of quantitative research, but criteria for grounded theory may vary ………. Charmaz, (2006, p.101)

Corbin and Strauss have stressed that the term validity and reliability are terms which are used more for qualitative inferences. These are not very important when carrying out qualitative research ……… Corbin & Strauss (2008, p.301)

There are many strategies suggested by Silverman (2005) to help increase the validity of the findings. These include constant comparison method where data collected is tested in next interview, treating data comprehensively and tabulating. Grounded theory method uses constant comparison thus validating the research.

However, Charmaz (2006, pp182-183) offers a list of criteria for evaluating constructionist grounded theory. Corbin and Strauss find these criteria’s to be the best and covering all aspects required for qualitative research ……… Corbin & Strauss (2008, p.299)

The four criteria which we will use to test the quality and validity of this research are
1. Credibility
2. Originality
3. Resonance
4. Usefulness

Let’s discuss each of the criteria in detail and test how this research stacks against these parameters. The table 18 provides the indicators for evaluation, and provides
assessment summary on criteria’s of Credibility, Originality, Resonance and Usefulness

**Credibility**

It is important to check how credible the research is so that it can be referred with confidence. As per Charmaz, the following points need to be addressed to test the credibility

- The gathered data and analysis should be linked logically
- The data collected should be sufficient to back the results
- The categories should be based on large size and array of empirical observations

This research used the mixed method to deduce its result. The use of mixed method has helped to triangulate the data. Also, the grounded theory method used for qualitative analysis uses constant comparison method which lends its credence to the validity of the results. This research has also used all types of data collection methods like

- Primary sources like questionnaire survey
- Secondary sources like key literature on the subject
- Interviews of key oil and gas professionals

The above has provided enough empirical evidence to support this research. Also the data is comprehensive and very detailed, which required few years to collect.
Table 18: Evaluation - Quality and validity of Research

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Criteria</th>
<th>Indicators</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Credibility</td>
<td>Do the categories cover a wide range of empirical observations Are the data sufficient to merit your claimed. Are there strong logical links between the gathered data and analysis</td>
<td>The researcher has used multiple modes of data collection like literature, govt. reports and experts. Also experts interviewed were from varied institutions to provide a holistic views. Constant comparison method also lends credibility thru validity of data at each stage. Mixed method has added has helped to triangulation of key data</td>
</tr>
<tr>
<td>2</td>
<td>Originality</td>
<td>Are your categories fresh. Do they offer new insights What is the social and theoretical significance of the work How does the grounded theory challenge, extend, or refine current ideas, concepts and practices</td>
<td>Research has offered a new integrated conceptual framework for development of gas markets in India. Also new categories were added like sustainable demand, tax incentives , competitive supply and regional gas hubs .</td>
</tr>
<tr>
<td>3</td>
<td>Resonance</td>
<td>Do the categories portray fullness of the studied experience Does your grounded theory make sense to your participants or people who share their circumstances</td>
<td>Constant comparison method in grounded theory helps in validating emerging categories . The last two interview not only validated all the concepts thrown by previous interviews but also did not provide any new category.</td>
</tr>
<tr>
<td>4</td>
<td>Usefulness</td>
<td>Does your analysis offer interpretations that people can use in their every day worlds How does your work contribute to knowledge. How does it contribute to make world better. Can the analysis spark further research in other substantive areas</td>
<td>The framework provided by the research would be useful for the government and decision makers to help develop gas markets which in turn would help in development of the countries economy.</td>
</tr>
</tbody>
</table>

**Originality**

The main points to consider for testing whether the research has got originality is

- The categories generated by the research should be fresh
- The categories generated should offer some new insights
- The output of the research should have social, practical and theoretical significance
- The method of grounded theory should have helped to refine current ideas, provided challenge to existing concepts and developed new ideas, practices or concepts.

The research offers a new insight, since this provides a framework for creating efficient gas market in India, which did not exist. As discussed in detail in section 10.1 of this chapter there were many fresh categories which got added to the conceptual lens and few categories got modified. Hence the grounded theory has helped challenge and extend/refine the current understanding.
India, as discussed earlier is a country of 1.3 billion people who need energy which is affordable. Development of gas markets will not only help achieve this objective in part (since other forms of energy also need to contribute) but also help India meet its emission targets (COP21)

**Resonance**

The key issues to be tested for resonance as per Charmaz is

- When the people are interviewed understand what has been asked and why and grounded theory resonate with their circumstances
- The categories which are built as per the research process should demonstrate completeness

The framework was created using the grounded theory. Constant comparison method in grounded theory help validate the emerging categories. The last two interviews with experts in the field not only validated the previous interviews / categories, but also did no through up any new category

The study did resonate with people interviewed and hence can be stated that it portrays fullness of the study.

**Usefulness**

The main areas if addressed demonstrates the usefulness of the research as per Charmaz

- The output and analysis offer ideas and solution which is useful for everyday work
- The research work should contribute to the existing knowledge and should help to make the world a better place to live.
- The research work and output should help stimulate further research in important areas.

The developed framework can potentially be used by the government, the regulators and the consultants to help develop a vibrant and functioning gas market which can be
termed efficient. This has also been discussed in the last section, hence need not be elaborated again.

In addition, this research throws open window for many multiple research in each category of the areas highlighted in the framework, since the objective was to create a framework and not go into details of the each and every element of the framework. Each element being a complex issue in itself can be picked up by future researchers.

Hence it can be stated with confidence that this research meets the criteria of credibility, originality, resonance and usefulness. Therefore, the research can be termed as potentially as valid and of high quality.

10.5 Research Limitation

No research can be done which can be termed as perfect. Each research has its own limitations. The main limitation of this research is discussed below so that this can be factored in by the users of this research in their understanding

- Most of the interviews were recorded, however being sensitive issue, three of the interviews with government / regulator could not be recorded. However, the researcher has used the following technique to ensure data is captured correctly and completely
  - Paraphrasing
  - Questioning
  - Checking
  - Working on data immediately post interview

- The output being a substantive conceptual framework, for gas sector, it cannot be generalized for other sectors

- This research does not claim that this is the only possible way to develop gas markets, but one of the ways to develop. There can be other ways to meet the same objective.
• Any research like this takes few years to complete, there can be bias in respondents based on in which year they were interviewed and /or responded.

10.6 Future work

A good research is the one that raises more question than it answers. This research to help develop efficient gas market has thrown up a framework to achieve this objective. Each category /variable in the framework is a complex piece of area and will require dedicated work. Also, each phase of the gas market framework can be taken up for further research to expand understanding of each element in the that phase or the whole framework.