Chapter IV
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Research Methodology

The Research Methodology chapter intends to explain the authors’ research position, the approach used in determining the structure of the thesis and the research strategy that leads to the fulfillment of the objectives laid out in this thesis. Moreover, the data collection method is going to show how and from where the information was collected. The population and sampling procedure explains the criteria and path used in the consumer survey, followed by information concerning the method for data analysis and ending with validity and reliability concerns regarding the study.

4.1 Introduction

Four types of studies can be called research namely, reporting, description, explanation and prediction. Cooper and Emory (1995) define research as a systematic inquiry aimed at providing information to solve problems. Academic research needs to go beyond mere description, rhetoric and sales stories. Questions need to be posed and investigated; themes need to be analyzed.

4.2 Purpose of Research

Yin (1994) categorizes case studies as exploratory, explanatory and descriptive. Exploratory research involves gathering information and developing ideas about a relatively under-researched problem or context. The value of exploratory research could be that it clears the ground for other kinds of research, or that it throws up interesting differences and comparisons between more well-studied topics, and those that are less well-studied. The prime purpose is to develop understanding in an area that is little understood. Since ‘exploratory research’ implies there is less of a basis from which to conduct research, and that a given area is not well understood, it is more appropriate to carry out this kind of research which would not involve testing particular hypotheses. In the scope of a dissertation, it could be quite difficult to pursue a research question that is exploratory, since there is less scope to build on the work of others. You would also need to know a body of literature quite well before you could demonstrate that what you were doing was in some way original or new, and that you could justify spending time as an ‘explorer’. It might also be harder to justify recommendations.
Not surprisingly, descriptive research involves describing a problem, context or a situation. This is a feature of exploratory research as well of course; however descriptive type questions are generally more structured and more reliant based on prior ideas and methods. You would more usually be describing what was happening in terms of pre-existing analytical categories, or relying on other ideas in some way. The basis for investigation might be a body of ideas in a given field (local government,) or related area (public sector management), and it could be the case that you develop hypotheses and explanations for what is going on. This type of study could be suited to either qualitative or quantitative methods: for example a case study is a descriptive piece of research; but statistics and numerical data can also be used to describe. A feeling of some descriptive research can be that it leaves the reader thinking ‘so what’. To avoid this, you would need to show how you're in depth description of what was happening somewhere had wider implications.

Explanatory research can be considered as being concerned with causes. The focus here is on seeking and providing or evaluating an explanation between two or more phenomena, for example ‘low pay causes people to leave’, or ‘poor management practices cause people to leave’. Explanatory research typically seeks to identify and explain a causal relationship that is substantively important or meaningful. In this kind of research, people typically develop hypotheses to be tested (in light of the extant literature) and then see whether the data they have collected can be called on to support or refute those hypotheses. This type of approach is more likely to employ quantitative methods, typically a survey, but one could also seek explanatory type research using case study, or observational data (Morrel 2006).

4.3 Research Approach

It is easy to memorize a list of factors to use in distinguishing between quantitative and qualitative research paradigms. Quantitative research is objective; qualitative research is subjective. Quantitative research seeks explanatory laws; qualitative research aims at in-depth description. Quantitative research means what it assumes to be a static reality in hopes of developing universal laws. Qualitative research is an exploration of what is assumed to be dynamic reality. It does not claim what is discovered in the process is universal and, thus, replicable (Mc. Kereghan 1998). It is quantitative research in the sense that we compare factors and find top priorities.
4.4 **Research Strategy**

Yin (1989) suggests that “empirical research advances only when it is accompanied by logical thinking, and not when it is treated as a mechanistic endeavor”. He indicates that surveys are preferred when “What”, “How much” and “How many” questions are being posed, when the investigator has little control over events and when the focus is on contemporary phenomena (Morrel 2006). The purpose of this thesis was to find information to answer “what” questions. The study did not require control over behavioral events. The study focused on collecting, analyzing and comparing data to get the opportunity to find critical elements influencing car users’ satisfaction and to make comparisons between them.

4.5 **Data Collection Method**

Survey can incorporate several different methods, including participant observation, structured or unstructured interviews and examination of documentary material. Before considering systematic methods for collecting data, you should remember that informal methods for obtaining information from customers clearly produce information that is valuable. Everyone needs to recognize and use these everyday opportunities for customer feedback, use this information to complement the more systematic forms of gathering feedback discussed here. Many formal methods can be used to collect customer feedback data. Methods frequently used to gather customer feedback include focus groups, a mail-back postcard that is included among materials sent to customers, a mail survey, electronic kiosk, a telephone survey, a publication evaluation form included at the back of every copy, and a printed or in-person survey (which might include computer – assisted personal interviews or an intercept survey where you ask every customer attending a function or visiting a facility to participate). (Institute for Citizen-Centred Service, 2001).

4.5.1 **Questionnaire and Interview**

The major difference between questionnaires and interviews is the presence of an interviewer. In questionnaires, responses are limited to answers to predetermined questions. In interviews, since the interviewer is present with the subject, there is an opportunity to collect nonverbal data as well and to clarify the meaning of questions if the subjects do not understand. The written questionnaire has some advantages. For one thing, it is likely to be less expensive, particularly in terms of the time spent collecting the data. Questionnaires can be given to large numbers of
people simultaneously; they can also be sent by mail. Therefore, it is possible to cover wide geographic areas and to question large number of people relatively inexpensively. Another advantage of questionnaires is those subjects are more likely to feel that they can remain anonymous and thus may be more likely to express controversial opinions. This is more difficult in an interview, where the opinion must be given directly to the interviewer. Also, the written question is standard from one subject to the next and is not susceptible to changes in emphasis as can be the case in oral questioning. There is always the possibility, however, that the written questions will be interpreted differently by different readers, which is one reason for carefully pre-testing questionnaires. The format of interviews and questionnaires, as that of observational methods, can range from very structured to very unstructured, depending on how much is know about the range of possible responses.

**Table 4.1 Interview & Questionnaire advantages**

<table>
<thead>
<tr>
<th>Advantages of the Interview</th>
<th>Advantages of the Questionnaire</th>
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<tr>
<td>The subject is able to read and write</td>
<td>This approach is less expensive in terms of time and money</td>
</tr>
<tr>
<td>The interviewer can observe the responses of the subject</td>
<td>Subjects feel a greater sense of anonymity</td>
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<tr>
<td>Questions may be clarified if they are misunderstood</td>
<td>The format is standard for all subjects and is not dependent on the mood of the interviewer</td>
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<tr>
<td>In-depth data may be obtained on any subject and are not dependent on predetermined questions</td>
<td>Large samples, covering large geographic areas, compensate for the expected loss of subjects</td>
</tr>
<tr>
<td>There is a higher response and retention rate</td>
<td>A greater amount of data over a broad range of topics may be collected</td>
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In deciding the questions to ask customers, it is a good idea to keep two principles in mind:

1) Make sure the questions and answer address your objectives, and
2) Set limits on the length of the survey instrument.

Survey questions are generally of two types: open-ended and close-ended. In open-ended questions, customers create their own answers. Close-ended questions limit the responses customers can provide. They may include yes/no answers, categories of responses, rank-ordered responses, or scales.
With close-ended questions, it is relatively easy to record and analyze responses, and you will not receive irrelevant or unintelligible responses. However, you risk missing the boat. This research utilized all of these approaches. Questionnaires were used to find critical factors of the user satisfaction and the interviews generally lasted for a half an hour duration and were unstructured. Observation has been used to examine teams and personnel and facilities involved in quality improvement in action. Since the aim of this study is classifying variables dimensions in automobile market from the consumers’ point of view, the main focus thus is car owners. A questionnaire was prepared to get an idea about the car owner’s experience and expectation in the automobile market. The questionnaire was distributed among Iranian and Indian car owners. A questionnaire was prepared to get an idea about the car owner’s experiences and expectations in automobile market. The questionnaire was distributed among Iranian and Indian car owners.

About 400 persons out of 735 Iranian users and 400 out of 915 Indian users replied. A survey is a procedure used to collect primary data from individuals. The questionnaire was developed based on research questions and frame of reference. For understanding the importance and satisfaction of each independent variables dimension, a 5-scale was used. Once we came up with the first draft of questionnaire, ten questionnaires were handed out to the Indian and Iranian users and they were asked whether the questions made sense to them and were they easy to understand. After modifying questions, the well-improved questionnaire was developed. Various steps were taken to ensure the validity of this study: (1) Data was collected from reliable sources; (2) Survey questions were made based on literature reviews and frame of reference to ensure the validity of the result; (3) Questionnaires had been pre-tested on the respondents before starting the survey, it was tested on at least 20 persons.

4.5.2 Sampling Selection

If the number of customers of interest is relatively small—not more than 50—each could be contacted to obtain feedback. This is the census approach. In many cases, services or products are provided to a large group of customers—a too large for a census approach. In such cases, a sampling approach is needed, and two options are possible.
- A judgment sample, in which you consciously select the customers you will contact from the entire group of customers served, and

- A probabilistic sample, in which customers you will contact are picked randomly from the entire group of customers served during the period interest (i.e. the past year).

In most cases, it is better to rely on a probabilistic sample than a judgment sample. Judgment samples may be biased because of the way customers are selected for the study. If a sample is biased, it is impossible to draw inferences about the entire group of customers served. As long as the response rate is high enough, probabilistic samples are not biased, so inferences can be made about the entire group of customers represented by the ones selected (Institute for Citizen – Centered Service, 2001). We preferred to use a probabilistic sample (cluster) and the automobile users were picked randomly.

4.5.3 Sample Size

The best advice for the novice researcher is to use as large a sample as possible. Large samples maximize the possibility that the means, percentages, and other statistics are true estimates of the population. They give the effects of randomness a chance to work. The chance or error goes down in direct proportion to the increased size of the sample. However, practical consideration is important too, for example, how many people are approached for the sample size. With random samples, it is possible to set the size of the sample according to how accurately you want to estimate the actual population parameters, or how much sampling error you are willing to accept. If you attempt to predict the necessary sample for your study using the formula, you will see that the larger the percentage of possible error you are willing to accept, the smaller your sample can be. Therefore, the more accuracy you are trying to achieve, the larger the sample should be. However, this formula is applicable only on probability samples. When you do use it, you must know the variance of the measurement you plan to use with your population. This means that the measurement must be at least at an interval scale, so that the variance can be calculated. The measurement must also have been used before with the same or a similar population so that the variance is known. You will find that if the variance is small, the sample size needs to be as large as when the variance is large. When none of the measurements vary too far from the mean for the population; it takes only a
small group to obtain measurements of what accurately reflect the population. But if there is a lot of variation in measurements, a larger group will be needed to incorporate the entire range of scores in the sample.

4.6 **Validity**

Validity refers to the accuracy of measure, and a measurement is valid when it measures what it is supposed to measure and performs the functions that it purports to perform. There are three major methods of estimating the validity of a data collection instrument. The greater the degree of validity of the data collection device, the more confident you will be that the result you achieve reflect true differences in the scores of your subjects and not some random or constant error. The degree of validity will reflect the degree to which we are controlling accounting for constant error. The degrees to which valid measurements can be achieved are directly related to the level of the study design. Exploratory descriptive designs, by nature, have a low level of validation and must rely heavily on estimates of reliability. Level II descriptive survey design can achieve a greater degree of validity but must still rely heavily on reliability estimates. Level III demands the highest degree of validity testing and uses reliability testing only to account for gaps in the attainment of validity. Just as control over the independent variable must increase with the level of design, so must control for error in data collection. Methods of establishing validity of the measurement technique fall into one of three categories: self-evident measures, pragmatic measures, and construct validity.

4.6.1 **Self – Evident Measures**

These methods of establishing validity deal with basic levels of knowledge about the variable and look at an instrument’s apparent value as a measurement technique rather than at its actual value. In other words, self-evident measures refer to the fact that the instrument appears to measure what it is supposed to measure.

4.6.1.1 **Face Validity**

At the most basic level, when little or nothing is known about the variable being measured, the level of validity obtainable is called face validity. “On the face of it….” Merely establishes that the tool seems an appropriate way to find out what you want to know. Looking at the questions you have developed to ask your subjects, you can say, “I think I will find out what I want to know by asking these questions. It
looks alright to me”. This is the extent of face validity. It is the lowest level of validation and is used only when you are beginning to study a particular variable and have no prior research literature to refer to. If there is literature on the variable, either theory or research, then face validity is not sufficient. If you have chosen to study a variable that has not been studied before, you will usually start with face validity, since it is the beginning step of the validation process.

4.6.1.2 Content Validity

Content validity is also a self-evident measure but involves comparing the content of the measurement technique to the known literature on the topic and validating the fact that the tool does represent the literature accurately. You want to obtain an adequate sampling of the content area being studied. Content validity is frequently estimated from the review of the literature on the topic or through consultation with experts in the field who have become experts by having done unpublished research in the area. After you have critically reviewed the literature, you construct your questions or instruments to cover the known content represented in the literature.

Content validity is a self-evident measure because it relies on the assurance that you can demonstrate an adequate coverage of the known field. An expert should be able to judge whether or not the tool adequately samples the known content. Researchers, therefore, frequently call upon experts in the field to verify content validity for newly developed tools. In exploratory descriptive studies using participant observation, you may be in situations where you do not know either the setting or the population. You assume that the persons you select to represent the population are knowledgeable about the content you are trying to elicit. In this case, you assume that the members of a group or population have face validity as experts in their culture or social roles, and you try to further validate each person’s report by talking with as many experts as possible. The more people you question, the more content you will gain and the more depth of data you will have at your disposal. “On the face of it” your informants appear to have face validity; you establish content validity of the data by cross-checking the answers with several informants until you are satisfied that the content is accurate.
4.6.1.3 *Pragmatic Measures*

Pragmatic measures of validity essentially test the practical value of a particular research instrument or tool and focus on the questions, “Does it work?” “Does it do what it is supposed to do?” Pragmatic validation procedures attempt to answer these questions. The two types of pragmatic measures are called concurrent validity and predictive validity.

4.6.1.4 *Concurrent Validity*

Instruments that attempt to test a research subject on some current characteristic have concurrent validity if the results are compared and have a high correlation with an established (tested) measurement. Suppose you have developed a checklist to measure car users’ satisfaction, to validate this test, you would need to compare it with the results of an established satisfaction instrument shown to be valid for car users. A high correlation between the results of the two tests would indicate concurrent validity for your checklist.

4.6.1.5 *Predictive Validity*

Instruments that accurately predict some future occurrence have predictive validity. Measures designed to predict success in transportation programs fall into this category, as do aptitude tests. They are designed to measure some current characteristic that is expected to predict something that will occur sometime in the future. Predictive validity is established by measuring the trait now and waiting to see if the event occurs as predicted. Once predictive validity has been established, the instrument can be used with confidence to discriminate between people on the basis of expected outcome.

4.6.1.6 *Construct Validity*

Construct validity provides the highest level of validation and is the most complex. It deals with the validation of the contract (theory, proposition, hypothesis or principle) that underlies the research. Here you are testing the theory that underlies the hypothesis or research question. The term is derived from the fact that the characteristic under study is not a directly observable phenomenon but, rather an abstraction or construct developed from observed behavior. To test the construct validity of a measuring instrument, you need to compare it with a number of other instruments that test for a similar construct. Instruments that test for part of the overall
construct should correlate highly with your new instrument. For those that measure different, but are related, theories should differentiate between yours and the others.

This study is not aiming to make any generalizations, thus this test will be taken into consideration. In this research, we have used interviews and questionnaires as sources of evidence. However the interviews have been used to complement the questionnaire and are not included in the analysis. The questionnaire was made through studies and reviewing different similar researches and interviews with my supervisors, and lecturers. A pilot test was conducted to get the car users’ feedback to modify and improve the questionnaire for getting desired results.

4.7 Reliability

Reliability refers to the consistency, stability, and repeatability of a data collection instrument. A reliable instrument does not respond to chance factors or environmental conditions; it will have consistent results if repeated overtime or if used by two different investigators. Reliability demonstrates that the operations of a study – such as the data collection procedures-can be repeated, with the same results (Yin 1984). The reliability of an instrument says nothing about its validity. It can be measuring the wrong concept in a consistent, stable fashion. There are three methods of testing the reliability of research instruments:

- tests for the stability of the instruments (how stable it is over time);
- tests for equivalence (consistency of the results by different investigators or similar tests at the same time);
- internal consistency (the measurement of the concept is consistent in all parts of the test).

Each test of reliability looks at a different aspect of the instrument. When developing, adapting, or utilizing someone else’s research instrument, you need to use one or more of these tests to establish the level of reliability of the instrument for your own use.

4.7.1 Tests of Stability

A stable research instrument is one that can be repeated on the same individual more than once and achieve the same results. Testing for stability, however, can be done only when you assume that the aspect being measured has remained constant.
Repeated observations and test/retest procedures are used to test the stability of an instrument. Even if there are transient influences present in the situation, it should measure the same way (within a reasonable range) each time the test is given.

4.7.2 Test of Equivalence

Test of equivalence attempts to determine if the same results can be obtained using different observers at the same time or if similar tests given at the same time yield the same results. In observational methods, when the characteristic being observed is expected to change over time, a test of stability cannot be used. The only way to determine if consistent (reliable) results can be obtained is to have two observers using the same instrument at the same time. Their results are compared, and the same results should be expected. When using a questionnaire, alternate forms of the questions can be used to determine equivalence. Two questionnaires are developed to measure the same content, the questions are interspersed, and the double questionnaire is administered to the same subjects simultaneously. Then, the questionnaires are separated for analysis, and the results are correlated the same way as a test/retest would be.

4.7.3 Test of Internal Consistency

Internal consistency refers to the extent to which all parts of the measurement technique are measuring the same concept. For example, when developing a questionnaire to measure depression of air traffic controllers, each question should provide a measure of depression consistent with the overall results of the test. To test the internal consistency of a questionnaire, the split-half method is often used. In this method, a questionnaire is divided in half by some random method, and the two halves are correlated. If they consistently measure the same concept, a high correlation will be obtained. To determine the reliability of the laboratory doing the tests, two parts of the same specimen can be sent separately to the same laboratory for analysis. The results can then be compared for consistency. Cronbach’s was used as an examination indicator to determine the reliability of the measurement scale of service quality after a pilot test. The value of Cronbach’s is generally required to be over 0.7 and the calculated results were over 0.7. The figures representing as the output of pilot test, it was observed that the reliability of all service dimensions, in
terms of Cronbach’s, was greater than 0.7. This meant that the measurement scale, applied in this paper, was reliable.

4.8 Techniques

Statistical analysis included two sample T-test, correlation analysis and descriptive statistic. Overall, the data analysis is conducted using a general-purpose statistical package called SPSS. We employed Excel software.

Descriptive Statistics are used to describe the basic features of the data gathered from an experimental study in various ways. A descriptive Statistics is distinguished from inductive statistics. They provide simple summaries about the sample and the measures.

Mean. The arithmetic average or mean takes into account all of the available information in computing the central tendency of a frequency distribution. Thus, it is usually the statistic of choice, assuming that the data are normally distributed data. The mean is computed by adding up all the raw scores and dividing by the number of scores \((M = ZX/N)\).

Median: The middle score or median is the appropriate measure of central tendency for ordinal level raw data. The median is a better measure of central tendency than the mean when the frequency distribution is skewed.

Mode: The most common category or mode can be used with any kind of data but generally provides the least precise information about central tendency.

Standard Deviation: This common measure of variability is most appropriate when one has normally distributed data, although the mean of ranked ordinal data may be useful in some cases. The standard deviation is based on the deviation of each score \((x)\) from the mean of all the scores \((M)\). Those deviation scores are squared and then summed \((L(x-M)^2)\). This sum is divided by \(N-1\), and, finally, the square root is taken \((SD = \sqrt{\sum(x-M)^2/N-1})\). A T-test is a procedure used for comparing sample means to see if there is sufficient evidence to infer that the means of the corresponding population distributions also differ. More specifically, for an independent-samples T test, a sample is taken from two populations. The two samples are measured on some variable of interest. A T-test will determine if the means of the two sample distributions differ significantly from each other.
Where:

$\bar{X}_1$ is the mean for Group 1,

$\bar{X}_2$ is the mean for Group 2,

$n_1$ is the number of people in Group 1,

$n_2$ is the number of people in Group 2.

$s^2_1$ is the variance for Group 1.

$s^2_2$ is the variance for Group 2.

**Pearson Correlation**

A correlation is a number between -1 and +1 that measures the degree of association between two variables (call them X and Y). A positive value for the correlation implies a positive association (large values of X tend to be associated with large values of Y and small values of X tend to be associated with small values of Y). A negative value for the correlation implies a negative or inverse association (large values of X tend to be associated with small values of Y and vice versa). Suppose we have two variables X and Y, with means $X_{BAR}$ and $Y_{BAR}$ respectively and standard deviations $S_X$ and $S_Y$ respectively, the correlation is computed as:

$$r = \frac{\sum_{i=1}^{n}\left(X_i - \bar{X}\right)\left(Y_i - \bar{Y}\right)}{\left(n-1\right)S_X S_Y}$$

There are some short cuts, but in general the formula is tedious and we let the computer do all this work. Suppose that an X value was above average, and that the associated Y value was also above average, then the product would be the product of two positive numbers which would be positive. If the X value and the Y value were both below average, then the product above would be of two negative numbers, which would also be positive. Therefore, a positive correlation is an evidence of a general
tendency that large values of X are associated with large values of Y and small values of X are associated with small values of Y. Suppose that an X value was above average, and that the associated Y value was instead, below average, then the product would be the product of a positive and a negative number which would make the product negative. If the X value was below average and the Y value was above average, then the product above would also end up being negative. Therefore, a negative correlation is evidence of a general tendency that large values of X are associated with small values of Y and small values of X are associated with large values of Y.

4.9 Conclusion

This chapter describes the research methodology and instrument development for the present study. The research instruments were developed based on established methodology in automobile industry. This research was conducted in Iran’s and India’s automobile markets. In this quantitative survey is used as data collection method. Since the aim of this study is classifying variables dimensions in the automobile market from the consumers’ point of view, the main focus thus is car owners. A questionnaire was prepared to get an idea about the car owner’s experiences and expectations in the automobile market. Once we came up with the first draft of the questionnaire, twenty questionnaires were handed out to the Indian and Iranian users and they were asked whether the questions made sense to them and were they easy to understand. After modifying the questions, a well-improved questionnaire was developed. The questionnaire was distributed among Iranian and Indian car owners. About 400 persons out of 735 Iranian users and 400 out of 915 Indian users replied. A survey is a procedure used to collect primary data from individuals. The questionnaire was developed based on research questions and frame of reference. The logical structure of questionnaire followed the order of variables dimension in the frame of the reference. For understanding the importance and satisfaction of each variables dimension, a 5-scale was used. In the subsequent chapter, we conduct hypothesis testing based on the established instrument and collected data.