CHAPTER 3

RESEARCH METHODOLOGY

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3.1 Introduction

Research is a thoughtful and systematic process aimed at expanding the boundaries of human knowledge and capabilities. It requires awareness and responsiveness to the world around us. In the field of social sciences, research plays a vital role in understanding and addressing societal issues. Social sciences focus on human behavior, social systems, and interactions, and the research conducted in this domain is known as social research.

Social research seeks to uncover hidden truths within social phenomena and identify the underlying principles that govern them. It serves as a method for social scientists to explore social values, ideals, behaviors, and their interconnections, as well as how these relate to natural laws. Human behavior is influenced by a range of biological, environmental, and cultural factors, making social research essential in identifying the causes and relationships behind various social dynamics. India, with its rich cultural heritage, has long integrated social sciences into its educational and research frameworks, giving the discipline a respected place in academia.

In today's digital age, the term "E-commerce" holds significant importance. It represents not just a concept, but a collection of business activities conducted through electronic means. The "e" in E-commerce symbolizes the electronic technologies that power these activities. Modern transactions—such as online payments, shopping, education, and shipping—are increasingly carried out electronically. With the expansion of digital platforms, areas like e-banking and e-logistics have become central to business operations. While much research has focused on the technological side of E-commerce, studies addressing the consumer experience remain limited, even as technology maintains progress rapidly and reshape user interactions.

3.2 Statement of Need

Research helps as a vital tool for understanding historical developments, addressing current challenges, and exploring the applications of emerging technologies. In the realm of social sciences, research plays a fundamental role in identifying societal issues and proposing viable solutions. Throughout the years, extensive research has been conducted in areas like marketing and consumer behavior. As technological advancements continue to shape the future, it is anticipated that life will become increasingly convenient through digital solutions.

While the marketing geography continues to grow rapidly, the Indian consumer has been relatively slower in adapting to global trends, especially in the context of e-commerce.

Although the digital marketplace is expanding worldwide, many Indian consumers are still transitioning into this new form of trade. Gujarat, a culturally rich and economically significant state, reflects this gradual shift. Traditional business practices remain deeply rooted, especially in regions like Saurashtra, where the integration of technology into daily commercial activities has been slower.

Within Saurashtra, the Rajkot district stands as a expanding urban center, yet the implementation of e-commerce—particularly among women—remains limited. Despite increasing access to the internet and the gradual modernization of lifestyles, many women in this region have yet to fully embrace online shopping and digital transactions. This gap highlights the need for a focused study on the perceptions, attitudes, and challenges women face in using e-commerce platforms in Rajkot. Understanding these factors can specify valuable visions for policymakers, marketers, and technology developers aiming to enhance digital inclusion and promote e-commerce adoption among women in this region.

3.3 Research statement

With the rapid global expansion of the digital economy, it has become essential to understand how different regions and demographic groups perceive and adopt e-commerce. In the Rajkot district of Gujarat, despite progress in urban development and increasing internet penetration, a significant portion of the female population remains underrepresented in online commercial activities. Various socio-cultural influences, limited digital literacy, concerns over the reliability of online platforms, and established shopping habits contribute to this restrained involvement. This research, titled "A Study on Perception of Women Towards E-Commerce in Rajkot District, Gujarat," aims to investigate how women in this region perceive e-commerce, the factors shaping their attitudes, and the barriers they encounter in adopting digital buying practices. The findings of this study are expected to provide meaningful insights that can inform targeted strategies, support inclusive digital transformation, and promote active participation of women in the evolving landscape of online commerce.

3.4 The Scope of study & types

Present work is an attempt to study the women perception towards e-commerce with special reference to Rajkot district region of Gujarat State. E-commerce offers many advantages to customers and retailers both the parties. Therefore, scope of e-commerce is wide, but it is limited for study purpose by exploring few factors with respect to Rajkot district

based on literature review as less research work was found in the Rajkot district that belongs to Saurashtra region of Gujarat state of India. Generally, the scope explains why some data are taken and some data are not taken, in other word the scope construct limitation of the study.

The main purpose to establish scope of the study is to bound area of the research. It covers special area concerned with object of the study. The scope reflects theories of the study, population and samples to be covered in the research. Plan, parameters and performance will be more fruitful if scope is clearly considerable.

3.4.1 Geographical Scope

The geographical scope of this study is limited to Rajkot district to ensure focused analysis and manageable variables. Urban, semi-urban, and rural areas have been randomly selected for balanced representation. This localized approach allows for meaningful insights and future comparative research.

3.4.2 Functional Scope

A clear grasp of the research area is essential for setting precise goals and expected outcomes. Defining a focused scope helps prevent confusion in data interpretation and avoids including unnecessary content. This study is centered specifically on transactions conducted through e-commerce platforms.

3.5 Research Design:

The research methodology adopted to achieve the objectives of this study integrates the following key components:

- A detailed literature review
- Development of the questionnaire
- Data collection and analysis
- Hypothesis testing
- Interpretation of results

This study employs a combination of exploratory, descriptive, and explanatory research designs to comprehensively understand women’s perceptions towards e-commerce.

- **Exploratory research** was conducted to gain deeper insights into women's online shopping behavior in Rajkot, particularly due to the scarcity of existing studies in this

regional context. This phase involved reviewing existing literature, consulting domain experts, and developing a structured questionnaire (Hair et al., 2003).

- **Descriptive research** was then used to gather data on women's demographic profiles and their patterns of online shopping. This design facilitated the systematic presentation of trends, preferences, and behavior related to e-commerce usage (Saunders et al., 2003).
- **Explanatory research** formed the core of hypothesis testing, aiming to analyze relationships between independent demographic variables (such as age, qualification, yearly income, occupation, duration of internet usage) and dependent variables like frequency of online transactions, trust in online shopping, and buying preferences. Based on the research objectives, the following hypotheses were formulated:
    - **H1**: There is a significant association between the frequency of online transactions and demographic variables (age, qualification, yearly income, occupation, duration of internet usage).
    - **H2**: There is a notable association between buying preferences and demographic variables.
    - **H3**: There is a notable association between trust in online shopping and demographic variables.
    - **H4**: There is a notable connection between the level of trust and six contributing e-commerce factors: Convenience, Post-Sales Services, Online Assistance, Reliability & Communication, Security & Privacy, and User-Friendliness.
    - **H5**: Buying preference is significantly related to the same six e-commerce factors.
    - **H6**: There is a notable difference in women's perceptions of these six e-commerce factors across different age groups.
    - **H7**: Perceptions of the six e-commerce factors vary significantly based on the duration of internet usage.
    - **H8**: Profession-wise differences exist in women's perception of the six factors.
    - **H9**: Qualification-wise differences exist in women's perception of the six factors.

These hypotheses serve as the foundation for statistical analysis, enabling a thorough examination of the factors influencing women's engagement with e-commerce platforms.

3.6 Survey Method:

The survey method is widely recognized as one of the most commonly employed strategies in business management research. It is typically aligned with a deductive research

approach, where large volumes of data can be gathered efficiently and cost-effectively from a target population. Surveys facilitate data collection through various tools such as self-administered questionnaires, structured observations, and interviews.

In the context of the present study, the survey approach was adopted to fulfill the research objectives. Both primary and secondary data sources were utilized to ensure a comprehensive understanding of the subject matter. The primary data was collected using a self-administered questionnaire, which was carefully designed based on an extensive review of relevant literature and in consultation with subject matter experts, including researchers, industry professionals, and academic scholars.

3.7 Population:

In research methodology, the term population refers to the entire group of individuals, elements, or units that possess certain characteristics relevant to the variables under investigation. This group may be homogeneous or heterogeneous depending on the nature of the study. In essence, the population represents the primary focus of a scientific inquiry. However, due to its potentially large size, it is often impractical or infeasible—both in terms of time and cost—to study every individual within the population.

To address this limitation, researchers commonly select a subset of the population, known as a sample, which serves as the basis for data collection and analysis. The sample is drawn in such a way that it accurately reflects the broader population's characteristics, allowing researchers to generalize their findings.

Populations can be further categorized into two types: the target population (or theoretical population) and the accessible population. The target population comprises all individuals or elements that meet the specified criteria of the study and is typically heterogeneous, representing the group to which the researcher intends to generalize the study results. The accessible population, on the other hand, is a subset of the target population that is practically available to the researcher for sampling purposes.

In the present study, the population consists of female consumers with prior experience in e-commerce who reside in the Rajkot district of Gujarat, India. This group forms the accessible population from which the sample was drawn for the purpose of the research.

3.8 Sampling Design

3.8.1 Sampling and Sample Collection

Sampling is the process of selecting a subset of individuals or elements from a larger population, allowing researchers to draw conclusions about the entire group. This is typically done after identifying a sampling frame, which is a defined list or group of individuals from the population who are eligible to be included in the sample. By studying the behavior and responses of the sample, researchers infer insights about the broader population.

In the present study, a combination of convenience sampling and random sampling techniques was employed, balancing the constraints of time and cost with the need for representative data. Convenience sampling allowed for the selection of participants based on their availability and willingness to participate, while elements of random sampling ensured that every individual within the accessible population had an equal probability of being selected.

A sample refers to the smallest unit drawn from the population and serves as a representative segment. It enables researchers to make statistical inferences without the need to study every individual in the population.

3.8.2 Sampling Frame

The sampling frame refers to the actual list or group of individuals from which the sample is drawn. For this study, the sampling frame comprised women with e-commerce experience residing in Rajkot district, Gujarat. This group included businesswomen, homemakers, working professionals, employed and retired women, as well as students who actively engage in online shopping and are familiar with e-commerce platforms.

These individuals were considered representative units of the broader population under investigation. According to Field (2005), such representative units are crucial for uncovering insights and drawing meaningful conclusions about the population as a whole.

3.8.3 Sampling Method

In any empirical research, it is essential to clearly define the sampling method used to select participants from the sampling frame. The choice of sampling method depends on several factors, including the nature of the study, research objectives, available resources, time, and budget.

Sampling techniques are broadly classified into two categories:

- Probabilistic methods, such as simple random sampling, stratified sampling, and multi-stage sampling, where every unit in the population has a known and equal chance of being selected.

- Non-probabilistic methods, such as convenience sampling, judgmental sampling, quota sampling, and purposive methods like snowball sampling, where the selection is based on specific criteria or researcher discretion.

For this study, the convenience sampling method, a type of non-probabilistic sampling, was adopted. This approach involves selecting individuals who are easily accessible and willing to participate. Despite the non-random nature of the selection process, this method was deemed appropriate due to time limitations, cost considerations, and the assumption that the population exhibited relatively homogeneous characteristics in their perception of e-commerce.

Convenience sampling is also referred to as opportunity sampling, accidental sampling, or haphazard sampling. It is widely used in social and behavioral research, particularly when access to participants is limited and when initial insights are being explored.

The decision to use convenience sampling in this research was informed by both theoretical and practical considerations, aligning with the study's objectives, scope, and resource availability.

3.8.4 Sample size

The sample size selected for a study must be adequately large to support meaningful statistical analysis and to ensure that the findings can be reliably generalized to the population under study. An appropriate sample size enhances the accuracy, reliability, and validity of the research outcomes.

The determination of sample size varies depending on several factors, including the nature of the research, geographical region, and the density and diversity of the population. For instance, studies involving heterogeneous populations—where participants differ significantly in characteristics—typically require a larger sample size to capture the variability. Conversely, homogeneous populations, where individuals share similar traits, may be effectively represented with a smaller sample.

Ultimately, selecting the right sample size is a critical methodological consideration that balances statistical precision with resource constraints such as time, cost, and participant accessibility.

For the recent study, sample size is 1270 after removing inappropriate response of respondent. A total of 1326 respondents covered up the google form questions and 56 were found inappropriate therefore it will be eliminated from the survey.

Therefore, the survey was based on 1270 sample size of accepted respondents which actively contributed to the study; so, we are considering this sample size as actual.

Here we must calculate the population of Rajkot district for finding sample data size, but when we want to find What is the population of Rajkot district in 2024? The question is not having correct answer because of the last census of Rajkot district was done in 2011, and next census of 2021 has been cancelled.

So, if we can go by the projection of Rajkot district population in year 2024 based on Population Growth Rate, that is assuming approx. 46 to 48 lakhs, where we find the estimated gender ration for male population is 24 to 25 lacs and the estimated female population is 22 to 24 lacs. (https://censusofindia.net/gujarat/rajkot/476?)

According to Krejcie & Morgan's one article in 1970 was related to calculate the sample size formula, the given below table indicate that 99% confidence interval with population of 25,00,000 require 1353 sample size with 3.5% margin of error and with 95% confidence interval with 3.5% margin of error require 784 sample size and here we are assuming 22 lacs of female population and we have taken the sample size of 1270 in present study which is very nearer to table's largest sample size.

Required Sample Size†

Population Size	Confidence = 95% Margin of Error				Confidence = 99% Margin of Error			
	5.0%	3.5%	2.5%	1.0%	5.0%	3.5%	2.5%	1.0%
10	10	10	10	10	10	10	10	10
20	19	20	20	20	19	20	20	20
30	28	29	29	30	29	29	30	30
50	44	47	48	50	47	48	49	50
75	63	69	72	74	67	71	73	75
100	80	89	94	99	87	93	96	99
150	108	126	137	148	122	135	142	149
200	132	160	177	196	154	174	186	198
250	152	190	215	244	182	211	229	246
300	169	217	251	291	207	246	270	295
400	196	265	318	384	250	309	348	391
500	217	306	377	475	285	365	421	485
600	234	340	432	565	315	416	490	579
700	248	370	481	653	341	462	554	672
800	260	396	526	739	363	503	615	763
1,000	278	440	606	906	399	575	727	943
1,200	291	474	674	1067	427	636	827	1119
1,500	306	515	759	1297	460	712	959	1376
2,000	322	563	869	1655	498	808	1141	1785
2,500	333	597	952	1984	524	879	1288	2173
3,500	346	641	1068	2565	558	977	1510	2890
5,000	357	678	1176	3288	586	1066	1734	3842
7,500	365	710	1275	4211	610	1147	1960	5165
10,000	370	727	1332	4899	622	1193	2098	6239
25,000	378	760	1448	6939	646	1285	2399	9972
50,000	381	772	1491	8056	655	1318	2520	12455
75,000	382	776	1506	8514	658	1330	2563	13583
100,000	383	778	1513	8762	659	1336	2585	14227
250,000	384	782	1527	9248	662	1347	2626	15555
500,000	384	783	1532	9423	663	1350	2640	16055
1,000,000	384	783	1534	9512	663	1352	2647	16317
2,500,000	384	784	1536	9567	663	1353	2651	16478
10,000,000	384	784	1536	9594	663	1354	2653	16560
100,000,000	384	784	1537	9603	663	1354	2654	16584
300,000,000	384	784	1537	9603	663	1354	2654	16586

Figure 3.1 Required Sample Size according to Population Size

3.9 DATA COLLECTION METHOD

There are 2 data collection methods: (1) Primary data collection and (2) Secondary data collection. In this study, most of the data was collected through primary data collection methods, with additional support from secondary data sources.

3.9.1 Data Collection

- Primary data

Primary data for the study was collected using a structured questionnaire in both

English and Gujarati to address the region's language diversity and literacy levels. The study's objectives were to test the association between education level and e-commerce habits. To gather accurate information, the questionnaire was designed to be easily understood by local respondents. Most of the responses were collected online using Google Forms. This method helped efficiently reach a broad range of participants across the Rajkot district.

- Secondary data

  Secondary data was gathered from government sources, along with newspapers, magazines, theses, articles, research papers, journals, e-books, and relevant e-commerce websites. These sources provided valuable insights to support the primary findings of the research.

3.9.2 Questionnaire Design and Development

This Questionnaire design maintains three different sections which are as under.

Section A involves 10 asks related to women's demographic Characteristics.

Section B includes 6 questions related to women's tastes and favorites to buy the goods & services from e-commerce, likes for online and offline method of buying products, faith for e-commerce platform and choosing from various payment options available in the marketplace.

Section C involves sixty different statements for measuring women customer's perception towards e-commerce using five-point Likert Scale ranging from Strongly Agree to Strongly Disagree.

The questions are under 5 categories like

(1) Security, Privacy, and Trust in E-Commerce – 8 questions

(2) Pricing, Payment, and Financial Options – 8 questions

(3) Shopping Experience, Convenience, and Service Availability – 20 questions

(4) Customer Support, Returns, and Logistics – 12 questions

(5) Product Comparison, Reviews, and Customer Satisfaction – 12 questions

3.9.3 Data processing method

To inspect the collected facts and test the proposed hypotheses, various statistical techniques were employed using SPSS. The selection of statistical tests was created on the nature of the

data and the type of variables involved:

- Chi-Square Test was worked to investigate the association between clear-cut variables such as age group and buying preferences (H1, H2, H3).
- t-Test was applied to compare means between two groups where applicable, such as assessing perception differences between two occupational groups (part of H8).
- One-Way ANOVA was utilized to compare the mean perception scores across more than two groups, such as age-wise, qualification-wise, and duration-wise comparisons of the six e-commerce factors (H6, H7, H9).

ANOVA:

The one-way Analysis of Variance (ANOVA), also known as Fisher's ANOVA, is a statistical technique used to identify significant differences in the mean values across two or more independent groups, particularly in the context of social science research. This method tests whether the observed differences between group means are statistically meaningful.
The primary objective of the one-way ANOVA is to evaluate the null hypothesis:

$$Ho: \mu 1 = \mu 2 = \mu 3 = \ldots = \mu k$$

Where μ represents the mean of each group and k denotes the number of groups being compared.

If the ANOVA test yields a statistically significant result, the null hypothesis is rejected, indicating that at least one group mean differs significantly from the others. Conversely, if the result is not statistically significant, the null hypothesis is retained, suggesting no meaningful difference between the group means.
In addition to one-way ANOVA, other statistical techniques were also employed for data analysis. While one-way ANOVA involves one dependent variable and a single independent variable, two-way ANOVA (also referred to as factorial ANOVA) extends this approach to scenarios involving one dependent variable and two or more independent variables, allowing for the analysis of interaction effects between factors.

t-test:

The t-test is a widely used inferential statistical method that assesses whether the mean scores of different groups are statistically distinct from one another. It is particularly useful in determining whether differences between group means are due to chance or reflect actual

variations between populations. Essentially, the t-test helps evaluate whether two means originate from the same population or differ significantly.

There are three primary types of t-tests employed in statistical analysis:

- **One-sample t-test**: This test examines whether the mean of a single sample significantly deviates from a known or hypothesized population mean. It is particularly useful when comparing a sample's mean score to a benchmark or target value to determine whether the sample underperforms or exceeds expectations.
- **Independent samples t-test** (also known as the two-sample t-test): This test is used to compare the mean scores of two independent groups to determine whether there is a statistically significant difference between them.
- **Paired samples t-test**: This version of the t-test is used when the two sets of data are related or matched in some way, such as pre-test and post-test scores for the same participants. It measures whether the average difference between paired observations is statistically significant. For example, it may be applied to assess differences in responses to two related concepts or treatments within the same group.

The general formula for the t-statistic is:

t = (Observed difference between sample means – Hypothesized difference between population means) / Standard error of the difference between sample means

The one-sample t-test focuses on validating the null hypothesis regarding a single mean, while the independent samples t-test is applied to evaluate differences between two group means. The paired samples t-test, on the other hand, accounts for the dependency between samples and compares the mean difference within paired observations.

Chi-square test:

The Chi-square (χ^2) test is a non-parametric statistical tool commonly used to examine the association between categorical variables. It tests whether the distribution of sample categorical data matches an expected distribution under the assumption of independence. The null hypothesis in this context posits that no relationship exists between the categorical variables being examined.

For instance, the Chi-square test can be applied to determine whether the proportion of outcomes—such as pass or fail—differs significantly across different categories. This analysis typically involves creating a contingency table (cross-tabulation), which displays the frequency distribution of variables. The test then evaluates whether the observed frequency

patterns deviate significantly from the patterns that would be expected if the variables were independent.

The formula used to compute the Chi-square statistic is:

$$\chi^2 = \Sigma [(f_o - f_e)^2 / f_e]$$

Where:

- χ^2 represents the Chi-square value
- f_o is the observed frequency
- f_e is the expected frequency under the null hypothesis
- Σ indicates the summation across all cells in the table

After calculating the statistic, it is compared with the critical value from the Chi-square distribution table, which depends on the degrees of freedom. In software like SPSS, a *p*-value (also referred to as the Asymptotic Significance) less than 0.05 is considered statistically significant. This indicates that the observed results are unlikely to have occurred by chance, leading to the rejection of the null hypothesis in favor of the alternative hypothesis.

The Chi-square test is versatile and is employed in both goodness-of-fit tests and tests of independence. While it is commonly classified under non-parametric tests, it can complement parametric analyses when exploring categorical variables.

Prior to conducting statistical tests, it is essential to assess the reliability and validity of the data to ensure credible results. Each statistical technique, including t-tests, ANOVA, correlation coefficients, regression models, and Chi-square tests, yields a test statistic and an associated *p*-value, both of which are interpreted in light of the degrees of freedom to draw meaningful inferences.

Validity of data:

Validity refers to the extent to which a tool or instrument accurately measures what it is intended to measure. It reflects the truthfulness, credibility, and appropriateness of the measurement process and ensures that the findings genuinely represent the concepts under investigation.

There are two main types of validity:

- **Internal validity** focuses on the accuracy of measurement within the study itself. It ensures that the observed results are attributable to the variables being studied rather than to external influences or errors in measurement.
- **External validity**, on the other hand, concerns the generalizability of the findings to the broader population. It evaluates how well the results of the study can be applied

beyond the sample used.

Both internal and external validity are essential for ensuring the overall credibility, relevance, and applicability of research findings.

Internal Consistency and Reliability

Trust refers to the consistency of results when a study is replicated under similar conditions. While validity contributes to reliability, reliability alone does not guarantee validity.

Reliability is a way of assessing the quality of the measurement procedure used to collect data in a Research. Test-retest reliability is the degree to which an evaluation tool when used multiple times, gives consistent results throughout a certain period.

But for research data to be valuable, authentic and utility, it must be both reliable and valid. Responses of the respondents may change, depending upon the repeatability of the questionnaire may be high and this is a part of test-retest reliability (same test with different times). In the Inter-rater Reliability different customers give the same score and rating for the similar questionnaire.

Average Inter-item reliability measures how strongly each item on a scale correlates with the others. It calculates the correlation coefficient between all possible pairs of items.

Split-half reliability involves splitting the items into two equal halves and measuring the correlation between the scores of each half. This method checks the consistency between different parts of the same test.

Cronbach's Alpha is a commonly used measure of internal consistency reliability. It signifies how well a set of objects measures a single unidimensional construct. The formula for Cronbach's alpha is:

$\alpha = [N / (N - 1)] * [1 - (\Sigma\sigma^2(\hat{Y}_i) / \sigma^2_x)]$

Where:

N = Number of items, $\Sigma\sigma^2(\hat{Y}_i)$ = Sum of the variances of each individual item

σ^2_x = Variance of the total score (composite)

Alternatively, using the correlation matrix, Cronbach's alpha can be calculated as:

$\alpha = (N * p) / [1 + p * (N - 1)]$

Where:

p = Mean inter-item correlation

Example:

If the mean inter-item correlation for a 6-item scale is 0.5:

$\alpha = (6 * 0.5) / [1 + 0.5 * (6 - 1)]$

$= 3 / 3.5$

$= 0.857$

For a 10-item scale with a mean inter-item correlation of 0.36:

$\alpha = (10 * 0.36) / [1 + 0.36 * (10 - 1)]$

$= 3.6 / 4.24$

$= 0.849$

Since $0.849 > 0.7$, the data is considered reliable, meaning that respondents consistently agree or disagree with the statements on the scale.

Results of Reliability:

Reliability Statistics	
Cronbach's Alpha	**N of Items**
.955	60

TABLE 3.1 Reliability Statistics

The above table 3.1 indicates that there were 60 items and the Cronbach's alpha value for the collected data is 0.955 which explains a high degree levelof consistency among items. All the 60 items were well above the 0.955, a commonly accepted threshold and all individual scale items were statistically significant (at $p < .05$ level). Hence, all items were deemed to be reliable.

Cronbach's Alpha indicates a high level of reliability hence this data can be carried on further for applying the other tools.

In present research The Cronbach alpha factor was calculated to test the trustworthiness of the questionnaire using SPSS.

As the rule of the Thumb, alpha 'α' coefficient value above 0.70 is regarded as acceptable. The calculated coefficient value of Cronbach alpha for our 60 statements/respondent's/ questionnaire, measuring women perception towards e-commerce is found out to be '0.955', which is more than the minimum required level of 0.70, hence the data is reliable.

Respondents profile: The study was built on the total Sample size of 1270 women. Hence,

the research was based on only the actual sample size which actively participated in the survey.

Factor Analysis

Factor analysis is a multivariate statistical technique used to identify essential relationships among studied variables that exhibit similar response patterns. It assumes that these observed variables are influenced by one or more unobserved variables, known as *factors*, and helps in reducing data complexity by grouping related variables together.

For instance, responses to demographic variables such as age, income, education, profession, and location often demonstrate consistent patterns, indicating the presence of underlying latent constructs influencing them.

Application in the Present Study

The present study, titled *"A Study on Perception of Women towards E-commerce in Rajkot District, Gujarat,"* explores various dimensions that affect women's engagement with e-commerce. With increasing digital adoption, literacy, and rapid technological advancements, the relevance and reach of e-commerce platforms are expanding significantly. Hence, understanding consumer perceptions—especially among women—is both timely and essential.

To capture these perceptions, a structured instrument comprising 60 items on a 5 point Likert scale was developed. This tool was designed based on extensive literature review and included relevant demographic variables to gather comprehensive primary data. The reliability of the instrument was tested using Cronbach's Alpha, ensuring consistency and internal validity of the responses. Data analysis was conducted using SPSS version 16.

For dimension reduction and variable grouping, Principal Component Analysis (PCA) was employed as part of the factor analysis. The PCA method, coupled with Varimax rotation and Kaiser Normalization, was used to simplify the data and extract the most considerable components. Prior to this, all individual variables were standardized to ensure comparability.

Through this method, the study successfully identified 6 key factors that collectively represent the underlying perceptions of women towards e-commerce in the Rajkot district. These factors serve as foundational constructs for further analysis and interpretation of consumer behavior in the region.

3.9.4 Statistical Tools and Hypothesis Testing Methods

To analyze the collected data and validate the research hypotheses, various statistical tools were employed using SPSS software. The selection of each test was based on the level of measurement of the variables involved and the landscape of the hypotheses—whether to determine associations, differences between groups, or relationships between variables. The following tools were used:

- **Chi-Square Test of Independence** – to examine the association between categorical variables.
- **Independent Samples t-Test** – to compare means between two independent groups.
- **ANOVA test** – to compare means across more than two groups.
    - **Post Hoc test to identify specific group differences after an ANOVA indicates a significant effect, ensuring you know where those differences lie.**

Below is a detailed breakdown of the hypotheses (H1 to H9), the corresponding null hypotheses, and the statistical methods used.

H1: Association between frequency of online transactions and demographic variables

Null Hypotheses:

- H01a: There is no significant association between women's age and frequency of online transactions.
- H01b: There is no significant association between educational qualification and frequency of online transactions.
- H01c: There is no significant association between annual income and frequency of online transactions.
- H01d: There is no significant association between occupation and frequency of online transactions.
- H01e: There is no significant association between the duration of internet usage and frequency of online transactions.

Statistical Tool Used: Chi-Square Test of Independence

H2: Association between buying preferences and demographic variables

Null Hypotheses:

- H02a: There is no significant association between age and buying preferences.
- H02b: There is no significant association between educational qualifications and

buying preferences.

- H02c: There is no significant association between annual income and buying preferences.
- H02d: There is no significant association between occupation and buying preferences.
- H02e: There is no significant association between duration of internet usage and buying preferences.

Statistical Tool Used: Chi-Square Test of Independence

H3: Association between trust in online shopping and demographic variables

Null Hypotheses:

- H03a: There is no significant association between age and trust in online shopping.
- H03b: There is no significant association between educational qualification and trust in online shopping.
- H03c: There is no significant association between annual income and trust in online shopping.
- H03d: There is no significant association between occupation and trust in online shopping.
- H03e: There is no significant association between duration of internet usage and trust in online shopping.

Statistical Tool Used: Chi-Square Test of Independence

H4: Relationship between trust and six contributing e-commerce factors

Null Hypotheses:

- H04a: There is no significant relationship between trust and convenience.
- H04b: There is no significant relationship between trust and post-sales services.
- H04c: There is no significant relationship between trust and online assistance.
- H04d: There is no significant relationship between trust and reliability & communication.
- H04e: There is no significant relationship between trust and security & privacy.
- H04f: There is no significant relationship between trust and user-friendliness.

Statistical Tool Used: t-Test

H5: Relationship between buying preference and six contributing e-commerce factors

Null Hypotheses:

- H05a: There is no significant relationship between buying preference and convenience.
- H05b: There is no significant relationship between buying preference and post-sales services.
- H05c: There is no significant relationship between buying preference and online assistance.
- H05d: There is no significant relationship between buying preference and reliability & communication.
- H05e: There is no significant relationship between buying preference and security & privacy.
- H05f: There is no significant relationship between buying preference and user-friendliness.

Statistical Tool Used: t-Test

H6: Difference in women's perceptions of six e-commerce factors across different age groups

Null Hypotheses:

- H06a–f: There is no significant difference in perceptions of convenience, post-sales services, online assistance, reliability & communication, security & privacy, and user-friendliness across age groups.

Statistical Tool Used: ANOVA test

H7: Difference in perception based on duration of internet usage

Null Hypotheses:

- H07a–f: There is no significant difference in perceptions of the six e-commerce factors based on the duration of women's internet usage.

Statistical Tool Used: ANOVA test

H8: Profession-wise difference in perception of six e-commerce factors

Null Hypotheses:

- H08a–f: There is no significant difference in perceptions of the six e-commerce factors across different professions.

Statistical Tool Used: ANOVA test

H9: Qualification-wise difference in perception of six e-commerce factors

Null Hypotheses:

- H09a–f: There is no significant difference in perceptions of the six e-commerce factors based on educational qualification.

Statistical Tool Used: ANOVA test

3.10 Period of study.

Time duration of the study was from 2019 to 2025 or up to the completion of research.