

ACCURACY AND RELIABILITY OF DATA ANALYSIS TECHNIQUES IN SECONDARY RESEARCH: A COMPARATIVE STUDY

Savita Nanda¹, Rajni Sharma²

¹Assistant Professor, Department of Mathematics, PTMLSD College, Gurdaspur, Punjab.
Email ID: rajnisharma15028@gmail.com

²Assistant Professor, Department of Mathematics, PTMLSD College, Gurdaspur, Punjab.

Abstract— The secondary research is most used because it allows the researchers to use existing information from the published sources such as research articles, books, government reports, and organizational records. The quality of secondary research study depends on the data analysis technique used. Different techniques may produce the different results even when the same data are analyzed. Therefore, choosing appropriate analysis method is very important for producing accurate and the reliable findings (Johnston, 2017; Saunders et al., 2019).

This study compares commonly used data analysis techniques in the secondary research. A comparative analysis approach was adopted and the information was collected from published research articles, books and reports. The study compares the qualitative content analysis, thematic analysis, descriptive statistical analysis, systematic review, and meta-analysis. These techniques are evaluated based on the accuracy, reliability, strengths, limitations, and their suitability for different research situations (Snyder, 2019; Creswell & Creswell, 2018).

The finding shows that no single technique is suitable for all the research problems. Qualitative techniques provide very good understanding of textual information but on other side the quantitative techniques provide more accurate numerical results. The systematic reviews and the meta-analyses produce highly reliable findings when they follow a structured and transparent process (Page et al., 2021; Borenstein et al., 2021). The study also shows that the quality of secondary research depends on both the quality of data sources and the analysis method selected.

The paper concludes that researchers should select data analysis techniques according to their research objectives, the type of available data and the level of accuracy required. The findings can help the researchers and students improve the quality of the secondary research.

Keywords: Secondary research, data analysis, accuracy, reliability, comparative analysis, systematic review, meta-analysis.

1. Introduction

Research is a very important process for creating the new knowledge and solving practical problems. Every research study depends on collecting the useful information and analysing it correctly. The quality of research findings is influenced not only by the data used but also by the

method selected to analysis that data. If an inappropriate analysis technique is used, the conclusions may not represent the actual information contained in the data (Creswell & Creswell, 2018).

Research data can be collected in two ways: primary research and secondary research. Primary research involves collecting the original data directly from participant through the surveys, interviews, observations or experiments. In contrast, the secondary research uses information that has already been collected and published by other researchers or organizations. Common sources of secondary data include research journals, books, government reports, company reports, conference papers, online databases, and international publications (Johnston, 2017).

Secondary research had become more popular because large amount of reliable information is now available through the digital libraries and online databases. Researchers can study different topics without conducting expensive and time-consuming fieldwork. This approach is mostly used in business, education, healthcare, economics, social sciences, and the public policy because it saves both time and resources (Saunders et al., 2019).

Although secondary research offers many advantages, it also presents several challenges. Researchers often work with data that were collected for another purpose. As a result, the available information may vary in quality, completeness, and relevance. Another major challenge is selecting most appropriate data analysis technique. Different techniques focus on different types of the data and may produce different interpretations of the same information (Bryman, 2021).

Accuracy and the reliability are two important measure of research quality. Accuracy refers to the extent to which the analysis correctly represents information available in original data. Reliability refers to the consistency of the analysis meaning that the similar results can be obtained when the same procedure is repeated under similar conditions. Both factors are necessary to produce trustworthy research findings (Leavy, 2022).

Many data analysis techniques are commonly used in secondary research. Qualitative methods, such as the content analysis and thematic analysis, are suitable for analyses textual information. Quantitative methods, such as the descriptive statistical analysis and the meta-analysis are more appropriate for the numerical data. Another most used approach is systematic review, which follows structured process to collect and evaluate evidence from multiple studies (Braun & Clarke, 2022; Snyder, 2019).

Each analysis technique has its strengths and limitations. For example: the thematic analysis provides a very detailed understanding of ideas and the experiences but may be influenced by researcher interpretation. Meta-analysis combined the numerical findings from many studies and usually produces highly reliable evidence, but it requires comparable datasets and statistical knowledge. Similarly, systematic reviews reduce selection bias through a structured process, although they require careful planning and significant time (Page et al., 2021; Borenstein et al., 2021).

Many previous studies have explains individual data analysis techniques. However, some studies have compared these techniques using the common criteria such as accuracy, reliability, transparency and suitability for the different research situations. As a result, researchers, especially beginners, may find it very difficult to decide which technique is the most appropriate for their study (Snyder, 2019).

To address the gap, the present study compares the five commonly used data analysis techniques in secondary research. The comparison focuses on the accuracy, reliability, strengths, limitations and practical applications. The study aims to provide clear understanding of when each technique should be used and how it can improve the quality of the secondary research.

Objectives of the Study

The study has the following objectives:

1. To identify the major data analysis techniques used in secondary research.
2. To compare these techniques based on accuracy and reliability.
3. To examine strengths and limitations of the each technique.
4. To recommend suitable analysis techniques for different types of secondary research.

Scope of the Study

This study focuses only on data analysis techniques used in secondary research. It compares five commonly used methods based on information obtained from published research articles, academic books, and research reports. The study does not include the primary data collection or any experimental analysis.

2. Preliminaries

2.1 Secondary Research

The secondary research is process of using data that have already been collected and published by other researchers or organizations. Instead of collecting new data, researchers analyse existing information to answer a research question. Common sources of secondary data include journal articles, books, government reports, company publications, conference papers, census data, and online databases (Johnston, 2017).

Secondary research is widely used because it saves time and cost. It also allows the researchers to study big datasets that is not possible to collect by the primary research. However, the quality of secondary research depends on the credibility of the data sources and the method used to analyses the data (Saunders et al., 2019).

2.2 Data Analysis in Secondary Research

Data analysis is the process of organizing, examining, and interpreting information to answer research questions. In the secondary research, analysis helps researchers identify patterns, compare findings, and draw meaningful conclusions from existing studies (Creswell & Creswell, 2018).

The appropriate analysis techniques improve the quality of research by reducing errors and increasing the trustworthiness of findings. In contrast the selecting an unsuitable technique may lead to incorrect interpretations and weak conclusions (Bryman, 2021).

2.3 Common Data Analysis Techniques

The following techniques are commonly used in secondary research.

Content Analysis: Content analysis is a qualitative technique used to analyse written documents such as research papers, reports, newspapers, and policy documents. Researchers classify the information into different categories and identify ideas or patterns. This technique is suitable when objective is to understand concepts, opinions, or communication. The results may be influenced by the researcher's interpretation (Krippendorff, 2019).

Thematic Analysis: Thematic analysis is qualitative method that identifies common themes across different studies or the documents. Researchers carefully read available literature, assign codes, and combine the similar ideas into broader themes. This method provides the detailed explanations and is widely used in education, psychology, healthcare, and social sciences (Braun & Clarke, 2022).

Descriptive Statistical Analysis: Descriptive statistical analysis summarizes the numerical data using the measures such as percentages, averages, frequencies and standard deviations. It helps the Researchers present large amounts of numerical information in a simple and the understandable form. Although this technique cannot explain the cause-and-effect relationships it provides accurate summaries of numerical data and supports the comparisons between studies (Field, 2018).

Systematic Review

A systematic review follows the structured process to identify, evaluate and summarize the previous research. Researchers use the predefined search strategies and selection criteria to reduce bias and improve transparency. Systematic reviews are considered very highly reliable because every step of the research process is clearly documented and can be repeated by other researchers (Page et al., 2021).

Meta-analysis

Meta-analysis is statistical technique that combines the quantitative findings from multiple independent studies. Instead of analyses the studies separately it calculates an overall result using the statistical methods.

This technique increases overall sample size and improves the precision of the research findings. However, it requires comparable studies and appropriate statistical knowledge (Borenstein et al., 2021).

2.4 Factors Affecting Accuracy and Reliability

The accuracy and reliability of secondary research depend on several factors as follows

- **Quality of Data Sources:** Reliable sources such as the peer-reviewed journals and official reports improve the research quality.
- **Data Relevance:** The selected data should be directly related to the research objectives.
- **Transparency:** The researchers should clearly explain steps followed during the data collection and analysis.
- **Researcher Bias:** Personal opinions should not influence interpretation of the findings.

- **Consistency of Method:** Applying same procedure throughout analysis improves the reliability (Bryman, 2021; Leavy, 2022).

2.5 Research Gap

Most previous studies explain how a single technique works rather than helping researchers decide which technique is most appropriate for a specific research problem. This makes selection process very difficult for new researchers.

Many studies discuss that the individual data analysis techniques used in secondary research. However, limited research compares these techniques using common evaluation criteria such as accuracy, reliability, strengths, limitations, and suitability for different research situations.

The present study addresses gap by providing a comparative evaluation of the five commonly used secondary data analysis techniques. The comparison is based on the published research articles and reports and focuses on the practical guidance for researchers (Snyder, 2019).

3. Research Methodology

This study follows comparative research design based on secondary data. No primary data collected. Information gathered from the peer-reviewed journal articles, academic books, government publications and the research reports related to the secondary research methods and data analysis techniques (Saunders et al., 2019).

The study used structured literature search to identify the relevant sources. Only English- language publications from the recognized academic publishers and research organizations were included. The duplicate studies, opinion articles and the sources without clear research methods were excluded to improve the quality of the analysis (Creswell & Creswell, 2018).

The five commonly used data analysis techniques were selected for the comparison:

- Content Analysis
- Thematic Analysis
- Descriptive Statistical Analysis
- Systematic Review
- Meta-analysis

Each technique was evaluated using the following criteria as following:

- Accuracy
- Reliability
- Ease of application
- Strengths
- Limitations

The comparative analysis approach was then used to identify the similarities and differences among the techniques. The findings are presented using the descriptive discussion and comparison tables to provide clear understanding of most suitable technique for the different research situations (Yin, 2018).

4. Comparative Evaluation of Data Analysis Techniques in Secondary Research

The quality of the secondary research depends on how effectively available data are analysed. Different data analysis techniques have the different objective and are suitable for different types research. Some methods focus on the understanding textual information but the others analyse

numerical data. Selecting the correct technique is necessary to improve the accuracy and reliability of research findings (Snyder, 2019).

This section compares the five commonly used data analysis techniques based on the published research articles and the reports. The comparison considers the accuracy, reliability, ease of use, strengths, the limitations and the suitable applications.

4.1 Comparison of Common Data Analysis Techniques

Technique	Type of Data	Main Purpose	Suitable Research Area
The content Analysis	Textual data	Identify patterns and categories	Media studies, policy analysis, education
The thematic Analysis	Qualitative data	Identify common themes	Psychology, healthcare, social sciences
Descriptive Statistical Analysis	Numerical data	Summarize and compare the data	Business, economics, education
Systematic Review	Published studies	Summarize the available evidence	Healthcare, management, education
Meta-analysis	Quantitative studies	Combine the statistical findings	Medicine, psychology, public health

Table 1 shows each technique has different purpose. Qualitative techniques are more useful for understanding opinions, experiences and the concepts, whereas the quantitative techniques are more suitable for analyses the numerical information. The systematic reviews and meta-analyses are generally used when the researchers need to combine evidence from multiple published studies.

4.2 Accuracy of Different Techniques

The accuracy refers to how correctly an analysis technique represents the information available in original data sources. The level of the accuracy depends on both the quality of the data and the analysis process (Leavy, 2022).

The descriptive statistical analysis provides the high accuracy when reliable numerical data are available because the calculations follow the standard mathematical procedures. Meta-analysis produces very highly accurate results by combining the statistical findings from many studies, reducing the influence of the random variation (Field, 2018). Content analysis and the thematic analysis also produce useful findings, but accuracy depends on the researcher's interpretation.

Different researchers may classify or interpret the same information very differently. These methods require clear coding procedures and careful documentation (Krippendorff, 2019; Braun & Clarke, 2022).

Systematic reviews improve the accuracy by using the predefined search strategies and selection criteria. This structured process reduces the possibility of selecting studies based on personal preference and helps make sure that the evidence is comprehensive (Page et al., 2021).

Comparison of Accuracy and Reliability

Technique	Accuracy	Reliability	Overall Performance
Content Analysis	Moderate	Moderate	Good
Thematic Analysis	Moderate	Moderate	Good
Descriptive Statistical Analysis	High	High	Very Good
Systematic Review	High	Very High	Excellent
Meta-analysis	Very High	Very High	Excellent

Table 2 The comparison shows that the systematic reviews and meta-analyses generally provide the most reliable evidence because they follow the structured procedures and use findings from multiple studies. Their success depends on quality of the included research (Page et al., 2021; Borenstein et al., 2021).

4.3 Reliability of Different Techniques

Reliability refers to consistency of the research findings when same analysis procedure is repeated. Descriptive statistical analysis has very high reliability because the standard statistical method produced consistent result when applied to same dataset. Systematic reviews also provide the high reliability because researchers follow the predefined protocols for searching, selecting and evaluating the studies. This protocol makes the research process transparent and more reproducible. Meta-analysis offers one of highest levels of reliability because it combines statistical evidence from many independent studies. This reduces effect of small sample sizes and improves the confidence in the final conclusions. The qualitative techniques such as the content analysis and thematic analysis may produce the different results if different researchers interpret the data differently. Reliability can improve by developing clear coding rules and involving more than one researcher during analysis process (Bryman, 2021; Page et al., 2021).

4.4 Strengths and Limitations

Each analysis technique has both the advantages and limitations. Researchers should understand the characteristics before selecting method (Cohen et al., 2018).

Strengths and Limitations of Data Analysis Techniques

Technique	Major Strength	Main Limitation
The Content Analysis	Simple and more flexible	Subjective interpretation
Thematic Analysis	Provides the deep understanding	Coding may vary between researchers
The descriptive Statistical Analysis	The accurate numerical summary	Limited to quantitative data
Systematic Review	Transparent and comprehensive	Time-consuming process
Meta-analysis	Strong statistical evidence	Requires comparable studies

Table 3 shows that no single technique is perfect. The selection should depend on research objective, available data and the expected outcomes.

4.5 Suitable Applications of Different Techniques

Different research problems need the different analysis methods. Content analysis is very suitable when researchers analyses the policy documents, news articles, reports or the educational materials. Thematic analysis is very good for studies that aim to understand experiences, opinions, attitudes from the published qualitative research. Descriptive statistical analysis is useful when the researchers work with numerical datasets such as government statistics, company reports or the educational performance data. Systematic reviews are recommended when researchers want to summarise the existing evidence on a particular topic using a structured and the transparent process. Meta-analysis is the best choice when several quantitative studies investigate the same research question and statistical results can be combined. Therefore, the choice of technique should always match the type of available data and the objectives of the study (Braun & Clarke, 2022; Borenstein et al., 2021).

4.6 Discussion

The comparison carried out in this study shows that quality of the secondary research depends not only on the availability of published information but also on the selection of an appropriate data analysis technique (Bryman, 2021).

The qualitative methods such as the content analysis and thematic analysis provide detailed explanations of ideas, opinions and the experiences. These techniques are mostly useful when researchers seek to understand complex social or the behavioural issues. Because they involve interpretation, their findings may vary among the researchers unless clear coding procedures are followed (Braun & Clarke, 2022).

The quantitative methods including the descriptive statistical analysis and meta-analysis, provide greater accuracy when analysing the numerical information. Their results are easier to verify because they are based on the established statistical procedures. Meta-analysis is special valuable because it combines the evidence from the multiple studies, increasing the strength and precision of the conclusions (Borenstein et al., 2021).

Systematic reviews occupy a very unique position because they can include both qualitative and quantitative evidence. By following the predefined search and selection procedures, systematic reviews reduce selection bias and improve the

transparency of the research process. For this reason, they are accepted as one of the most reliable approaches for the evidence-based research (Page et al., 2021).

The findings suggest that no single analysis technique is best for every research problem. Researchers should consider the type of data available, the objectives of the study, and required level of accuracy before selecting an analysis method. Combining the appropriate data sources with a suitable analysis technique can significantly improve the quality and reliability of secondary research (Creswell & Creswell, 2018).

5. Conclusion

The secondary research plays very important role in academic and professional studies because it allows researchers to use the existing knowledge efficiently. The usefulness of secondary research depends most on the data analysis technique selected (Saunders et al., 2019).

This study compared the five commonly used data analysis techniques: content analysis, thematic analysis, the descriptive statistical analysis, systematic review and the meta-analysis. The comparison showed that each technique has specific strengths and the limitations. Qualitative techniques provide a very detailed understanding of textual information, while quantitative techniques produce more accurate numerical results. The systematic reviews and meta-analyses was found to offer the highest reliability when conducted using the structured methodology (Page et al., 2021; Borenstein et al., 2021).

The study concludes that the researchers should select data analysis techniques according to their research objectives, the nature of the available data and the level of accuracy required. Careful selection of both the data sources and analysis methods can improve the quality, transparency and reliability of the secondary research findings (Creswell & Creswell, 2018).

6. Future Scope

Future studies can increase this research by comparing the additional data analysis techniques used in the different academic disciplines. Researchers may also explain the effectiveness of software tools such as NVivo, ATLAS.ti, SPSS, R and Python for analysing the secondary data. Further the research may compare the manual and artificial intelligence-assisted data analysis to examine their impact on the research accuracy, reliability, and also the efficiency. In addition, the studies involving larger datasets from different countries and the research fields can provide much evidence for selecting the most suitable data analysis techniques (Flick, 2022).

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