Quantitative Data Analysis using PLS-SEM (SmartPLS): Issues and Challenges in Ethical Consideration

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Abstract

In research, ethical issues are crucial, including the preservation of participants' rights, privacy, and well-being to secure informed consent and minimize potential harm. Throughout the study, researchers must maintain transparency, honesty, and integrity, promoting trust and credibility in the pursuit of knowledge. In the realm of quantitative research, the process of data analysis plays a fundamental role, serving as a critical element in the generation of reliable and precise findings. The purpose of this concept paper is to provide the growing recognition of the ethical importance of quantitative data analysis in research. This paper delves into the ethical aspects of quantitative data analysis, underscoring the necessity for researchers to approach matters related to data collection, storage, and analysis with meticulous attention when using SmartPLS. This study highlights that preserving privacy and confidentiality requires the secure handling of various data types, especially those containing personally identifiable or health information. Additionally, it is crucial to subject biases and discrimination in data analysis to rigorous examination to ensure fair representation and mitigate potential negative consequences. The current prevalence of privacy breaches and the accompanying ethical concerns underscore the critical importance of prioritizing ethical considerations. This paper also explores the ethical complexities unique to Partial Least Squares Structural Equation Modelling (PLS-SEM), a widely used statistical technique across multiple disciplines by using SmartPLS software. SmartPLS enables researchers to analyse intricate relationships, facilitating the derivation of significant conclusions. Nevertheless, researchers employing SmartPLS must remain attentive to distinct ethical dilemmas, particularly those related to the interpretation, management, and disclosure of data. The exercise of ethical vigilance becomes essential when the conclusions drawn from SmartPLS have an impact on various stakeholders, such as employees, consumers, and shareholders. Researchers can ensure the integrity, accountability, and ethicality of their research endeavours by adhering to ethical guidelines, conducting comprehensive analyses, and exercising caution when making generalizations while utilizing SmartPLS.

Keywords:

Quantitative Research, PLS-SEM, Research Ethics, SmartPLS

INTRODUCTION

The landscape of research has been utterly transformed as a result of improvements in technology as well as the availability of ever-growing data troves (Lach, 2014). Because of this transition, researchers have been able to explore processes that were previously inaccessible and discover insights that were previously unknown. The analysis of data is an extremely important component of quantitative research since it helps provide reliable and precise conclusions about the findings of the research. As the importance of quantitative data analysis is highlighted in an increasing number of studies, researchers are forced to confront the ethical challenges posed by this research approach (Bloomfield & Fisher, 2019).

According to the definition provided by Hair Jr. et al. (2019), quantitative data analysis refers to the process of collecting, organizing, and analyzing numerical data to identify patterns, correlations, and trends. It equips academics with the tools necessary to conclude, form valid judgments, and make strides forward in the comprehension of a wide variety of subject areas. Within the context of the research process, however, the application of quantitative approaches and analytical procedures must follow ethical standards to maintain integrity, accountability, and respect for human rights (Aguinis et al., 2023; Panter & Sterba, 2011).

The study of quantitative data has substantial ethical repercussions, and it is essential to be aware of the risks and repercussions that come with collecting, storing, and analyzing this data to avoid any potential problems (Zyphur & Pierides, 2017). When it comes to protecting the confidentiality of the individuals who took part in the research or the communities that were investigated, the handling of sensitive data, such as personal information and medical records, requires an increased level of attention and caution. A fair representation of all parties must be ensured, and the detrimental consequences of biased data analysis must be mitigated as much as possible by identifying and eliminating any forms of bias and discrimination that may exist (Treloar et al., 2004).

Recent data breaches, privacy scandals, and growing concerns about data ethics have made it abundantly clear that ethical considerations in quantitative data analysis cannot be disregarded or relegated to a smaller role. This is because ethical considerations are fundamental to the integrity of the data (Aguinis et al., 2023; Jones, 2012). The importance of these issues has been brought to the forefront as a result of recent data breaches, privacy scandals, and concerns over data ethics (Lock & Seele, 2015). Researchers and academicians must acknowledge the ethical responsibilities that come with data analysis and devise strategies to protect the rights of participants, increase transparency, and prioritize the health and safety of those whose lives will be altered as a result of the findings of the study (Aguinis et al., 2023; Rosenthal & Rosnow, 2013).

QUANTITATIVE ANALYSIS IN BUSINESS STUDIES

Quantitative data analysis is a crucial component of the business studies discipline since it helps produce insights, influences decision-making, and drives organizational performance. It is essential to address the ethical considerations that surface during the process of quantitative data analysis in light of the growing importance of data-driven initiatives in business (Lock & Seele, 2015; Panter & Sterba, 2011; Zyphur & Pierides, 2017).

Quantitative data analysis is the process of examining data in numerical form to identify patterns, relationships, and trends (Scherbaum & Shockley, 2015). Researchers and

businesspeople can draw more accurate conclusions and make more educated choices as a result of this. The application of quantitative methods and analytical tools must be carried out ethically to guarantee that the research procedure is open and accountable, as well as considerate of the requirements of all parties that are engaged (Zyphur & Pierides, 2017).

Understanding the ethical implications of quantitative data analysis in the field of business studies requires taking the necessary step of recognizing the potential ethical issues and consequences of data collection, interpretation, and analysis. This is a necessary step toward achieving an understanding of the ethical implications of quantitative data analysis. When running research on business studies, it is standard procedure to handle sensitive data, such as information on clients, financial records, and the findings of market research. This may be a stressful and time-consuming process. At all times, this information needs to be handled with the utmost care to preserve the privacy of consumers and maintain the security of the information. To earn the trust of the participants and to maintain the ethical standards of the research, their rights and interests must be maintained. This involves safeguarding the legal standing and financial interests of employees, clients, and any other relevant parties (Panter & Sterba, 2011).

In addition, biases and possible instances of discrimination can make their way into quantitative data analysis, which can lead to results that are skewed or unfair. The field of business studies is responsible for minimizing these biases to assure accurate representation and limit the possibility of unfavorable results caused by faulty or biased data analysis (Bell et al., 2022). Ethical considerations also include the appropriate utilization of data, which includes the honest reporting of methods, the correct depiction of findings, and the avoidance of misleading interpretations that could affect corporate operations and decision-making (Zyphur & Pierides, 2017).

It is impossible to deny the presence of ethical implications in quantitative data analysis in light of the growing number of instances of data breaches, privacy scandals, and public concerns regarding the ethical treatment of data in the business sector (Hasan et al., 2021). Throughout the entire process of data analysis, researchers, business professionals, and organizations need to be aware of the ethical duties that are theirs (Steffen, 2016). This includes the development of measures to preserve privacy, ensure informed consent, maintain confidentiality, and emphasize the well-being of those whose lives are affected by the findings of the study.

This article's goals are to (1) expose the ethical considerations that come up when using PLS-SEM for quantitative data analysis (SmartPLS) and (2) emphasize the significance of those considerations in preserving the integrity of research findings, maintaining the trust of scholars, and cultivating a culture of responsible research. By adhering to key ethical standards such as informed permission, data confidentiality, transparency, and responsible reporting, researchers can traverse the ethical obstacles that are connected with PLS-SEM and improve the ethical integrity of their research when using SmartPLS.

In the field of business studies, the importance of taking ethical factors into account during quantitative data analysis cannot be overstated. These considerations help to ensure the data's integrity, dependability, and responsible application (Zyphur & Pierides, 2017). In the context of business studies, the purpose of this paper is to expose the ethical implications of quantitative data analysis, especially using SmartPLS software. This review gives insights into the ethical considerations that researchers and practitioners must face while doing quantitative

data analysis in the business domain by addressing major themes, approaches, and frameworks (Jones, 2012).

Informed Consent and Data Collection

To fulfil one's ethical responsibilities when conducting quantitative data analysis, it is essential to obtain the participants' informed consent (Panter & Sterba, 2011). A multitude of academic studies highlights how important it is to adequately communicate research aims, data-gathering techniques, and the potential advantages and risks to participants (Saunders & Lewis, 2017). In addition to the recommendations provided by Saunders and Lewis (2017), researchers need to ensure that participants have a comprehensive understanding of the data usage, protection, and anonymization, while also upholding their rights to withdraw from the study at any point in time. This is a responsibility that falls squarely on the shoulders of the researchers.

Data Confidentiality and Privacy Protection

Quantitative data analysis frequently requires the use of confidential information, such as information from respondents, salary records, or the results of market research. When it comes to sustaining ethical values in the field of business studies, protecting the privacy and confidentiality of data subjects is of the utmost importance (Manna et al., 2020). Researchers are required to put in place stringent data security measures such as encryption, controlled access, and safe storage to reduce the likelihood that personal information may be improperly disclosed or used without authorization. The use of anonymization strategies, such as data aggregation or masking, can improve the safety of personal information while still allowing for significant research to be conducted (Kaiser, 2009).

Bias and Fair Representation

Quantitative data analysis can be affected by biases, both conscious and unconscious, which might compromise the neutrality and objectivity of the findings of a study (Hair Jr et al., 2019; Saunders & Lewis, 2017). When collecting data, selecting samples, and conducting analyses, researchers have a responsibility to remain watchful to identify and mitigate any biases that may occur. It is essential to make certain that study samples are both inclusive and representative to reduce the possibility of biases resulting from the underrepresentation or overrepresentation of particular groups. It is possible to make significant strides toward eliminating prejudice and fostering equal representation in the field of business studies by making use of appropriate statistical tools and rigorous study designs (Aguinis et al., 2023).

Data Transparency and Reporting Practices

It is necessary to uphold transparency throughout the quantitative data analysis process to guarantee the reproducibility and validity of the research findings. Documenting, discussing, and reporting findings under established standards and criteria is something that researchers

need to undertake (Aguinis et al., 2023). This includes providing explicit descriptions of the procedures used to collect data, as well as the definitions of variables and the analysis methodologies. In the field of business studies, providing transparent reporting helps to improve the credibility and trustworthiness of quantitative data analysis. This is accomplished by allowing other researchers the opportunity to verify and replicate results, which in turn makes it easier to validate findings.

Ethical Use of Data for Decision-Making

Ethical considerations about quantitative data analysis extend beyond the research phase and cover the implementation of findings in the process of making decisions for businesses. Researchers and practitioners alike need to conduct an exhaustive examination of the possible effects that their data analysis may have on a wide variety of stakeholders, organizations, and society. Academics and practitioners can be guided in evaluating the potential benefits and drawbacks of data-driven decisions by a variety of ethical decision-making frameworks, such as the stakeholder theory and consequentialism. These frameworks can also help readers assume responsibility for the ethical consequences of data-driven decisions.

PLS-SEM IN QUANTITATIVE DATA ANALYSIS

A Method Using Partial Least Squares Structural Equation Modeling, also known as Partial Least Squares Structural Equation Modeling (PLS-SEM), is gaining popularity as a method for analyzing quantitative data in numerous fields, including business and management (Becker et al., 2023; Ong & Puteh, 2017). PLS-SEM enables researchers to study complicated relationships, test theoretical hypotheses, and achieve a deeper comprehension of intricate processes (Aguinis et al., 2023; Romo-González et al., 2018). PLS-SEM has a lot of untapped potential when it comes to quantitative data analysis, but as it gains greater traction in the scientific community, it also raises several one-of-a-kind ethical concerns that need to be addressed (Latan et al., 2023).

Because it concentrates on the analysis of correlations between latent variables and the observable indicators of those variables, the PLS-SEM statistical method can cover a wide range of topics (Sarstedt et al., 2021). This makes the evaluation of complex models much simpler, which enables researchers to arrive at conclusions that are richer in insight and to base their decisions on data that is more trustworthy. The use of PLS-SEM ought to be guided by ethical considerations to maintain the integrity and openness of research while safeguarding the rights and welfare of those who take part in it.

To cultivate a complete awareness of the ethical implications of quantitative data analysis using PLS-SEM by SmartPLS software, it is essential to get an understanding of the potential threats and repercussions that are associated with the data collecting, interpretation, and analysis processes (Ong & Puteh, 2017). Information that could be used to identify a particular person or confidential business information must be managed with the utmost care to prevent the information from being disclosed or misused in any way. This includes both personal and commercially sensitive information. Ethical issues also include the provision of

clear documentation of analytical techniques, the building of a reliable model, and the honest reporting of data to prevent the formation of incorrect conclusions.

The PLS-SEM method of analyzing quantitative data is becoming increasingly popular among academics; hence, the ethical repercussions of using this technique must be properly investigated. When PLS-SEM is used to influence business decisions, there are major repercussions for employees, consumers, and shareholders. As a result, researchers have a responsibility to give essential importance to ethical considerations. Researchers can make ethical use of the PLS-SEM by adhering to standard practices, conducting exhaustive studies, and drawing constrained conclusions based on their findings (Panter & Sterba, 2011; Rosenthal & Rosnow, 2013; Zyphur & Pierides, 2017).

ADVANTAGES OF PARTIAL LEAST SQUARES STRUCTURAL EQUATION MODELING (PLS-SEM)

Partial Least Squares Structural Equation Modeling (PLS-SEM), is a strong statistical method for quantitative data analysis that has arisen in the field of business studies (Becker et al., 2023; Ramayah et al., 2018; Romo-González et al., 2018). PLS-SEM gives researchers the ability to investigate complicated correlations between latent variables and the observable indicators of those variables, which makes it a useful tool for the testing of theories, the evaluation of models, and the validation of hypotheses (Wong, 2013). This literature review aims to provide an overview of the existing research on the application of PLS-SEM in quantitative data analysis within the context of business studies, with a focus on important themes, methodologies, and contributions to the field. Specifically, this review will be looking at. (Richter et al., 2016).

Advantages and Capabilities of PLS-SEM

Because of its many benefits, PLS-SEM is ideally suited for use in the field of business studies (Hair et al., 2021; Ramayah et al., 2018). These benefits include its ability to manage non-normal or categorical data, handle complex models with small sample numbers, and accept formative measurement approaches. In addition, it can handle complex models with very small sample sizes (Dash & Paul, 2021). PLS-SEM has been positioned as a preferable method for exploratory research, theory creation, and predictive modeling in the field of business studies as a result of the research that has been conducted highlighting the flexibility, robustness, and efficiency of PLS-SEM (Romo-González et al., 2018).

Model Assessment and Validity

Within the context of PLS-SEM, researchers have focused their attention on determining whether or not a model is valid and whether or not it fits the data. Several distinct approaches and criteria, including an evaluation of the measurement model, an evaluation of the structural model, and an evaluation of the overall model's fit, have been presented and analyzed. The significance of constructs, path coefficients, and mediation or moderation effects has been investigated by researchers, and they have provided direction on how to evaluate the validity

and reliability of models developed using PLS-SEM (Becker et al., 2023; Hair Jr et al., 2019; Ramayah et al., 2018).

Mediation and Moderation Analysis

PLS-SEM makes it easier to conduct analyses of mediation and moderation, allowing researchers to investigate the indirect and conditional impacts of variables inside complicated models. PLS-SEM has been utilized by researchers in the field of business studies to explore the numerous mediation and moderation frameworks that have been proposed and to investigate the correlations that exist between antecedents, mediators, moderators, and outcomes. To evaluate the significance of these effects and determine how robust they are, bootstrapping techniques and significance tests have been utilized (Becker et al., 2023).

Predictive Modeling and Structural Analysis

PLS-SEM has been utilized by academics for predictive modeling and structural analysis in the field of business studies. PLS-SEM makes it possible to investigate complex correlations and locate the factors that are most influential in determining results. The method has been useful in many different areas of business, including marketing, organizational behavior, strategy, and supply chain management. It has been able to assist in the forecasting of customer behavior, the evaluation of organizational effectiveness, and the investigation of tactical and strategic decision-making (Becker et al., 2023; Kock, 2015; Ramayah et al., 2018).

Multigroup Analysis and Cross-Cultural Studies

PLS-SEM has been used to carry out multigroup analysis and cross-cultural research, as it enables comparisons to be made between various subgroups or cultural settings (Baskaran et al., 2021). Researchers have investigated the measurement and structural invariance across groups, looking for differences in how constructs are related to one another in various cultural contexts. Our understanding of how cultural influences influence business phenomena and decision-making processes has been significantly improved as a result of the application of PLS-SEM in cross-cultural research (Becker et al., 2023; Ramayah et al., 2018; Sarstedt et al., 2019).

PLS Predict

PLS Predict is a module that can be found within the SmartPLS program, which is extensively utilized in the fields of research and data analysis for structural equation modeling (SEM) (Shmueli et al., 2016). PLS Predict is a program that has been developed exclusively to make predictions and evaluate the quality of predictive models that have been generated by the method of Partial Least Squares (PLS) route modeling (Shmueli et al., 2019). It provides researchers and analysts with the ability to add new data to an existing PLS model and acquire predictions for the model's latent variables as well as its observable variables (Sharma et al.,

2022). This feature is useful for analyzing the generalizability and effectiveness of the PLS model beyond the data that were used for its initial estimation. As a result, the PLS model is a useful tool for predictive modeling in a variety of domains, including economics, the social sciences, and business (Becker et al., 2023).

Robustness Check

In SmartPLS, the term "robustness check" refers to a method that evaluates the consistency and dependability of the results obtained from a structural equation model (SEM) or a partial least squares (PLS) model, particularly when working with complex and potentially noisy data. This evaluation is performed to determine whether or not the results can be trusted. It entails testing the outcomes of the model systematically by introducing variations or perturbations in the data. These can be in the form of adding or removing variables, changing sample sizes, or employing different estimation algorithms. This is done to ensure that the model's findings remain consistent and robust under a variety of conditions. Researchers can gain confidence in the validity and generalizability of their SEM or PLS model by doing robustness checks. This helps researchers confirm the robustness of their study findings as well as the stability of their structural models in the face of numerous data adjustments (Becker et al., 2023).

Ethical Considerations in PLS-SEM

In recent years, there has been an increased focus on the importance of taking ethical concerns into account while applying PLS-SEM. When it comes to using PLS-SEM for quantitative data analysis, academics have emphasized how important it is to maintain transparency, integrity, and responsible reporting throughout the process. Concerns about ethics include topics such as providing informed consent, maintaining the confidentiality of data, and using and interpreting results responsibly. When it comes to navigating these ethical problems brought about by the application of PLS-SEM in the field of business studies, researchers have developed recommendations and frameworks (Latan et al., 2023).

SMARTPLS 4.0

SmartPLS is a piece of software that was developed specifically to perform partial least squares structural equation modeling (SEM). It was not until the late 1990s that it was first conceived, and since then, it has undergone iterative developments, which have culminated in several versions. Before the announcement of SmartPLS 4.0, everyone was talking about SmartPLS 3. Prof. Dr. Hermann W. Homburg and the members of his research team at the University of Mannheim in Germany were the ones who first presented SmartPLS 1 to the public in the late 1990s. With a primary focus on ease of use, the program was developed largely to cater to the requirements of practitioners and researchers who are interested in making use of the PLS-SEM technique (Hair Jr et al., 2021).

Scholars, notably those in fields like as marketing, management, information systems, and the social sciences, have begun to use SmartPLS in large numbers. This trend has attracted

a significant amount of attention. The software is well-known for the user-friendly interface that it provides, which has been carefully developed for straightforward navigation. In addition to this, it exhibits a great level of proficiency in managing complex models, data that is not normal, and tiny sample sizes. In addition to this, it offers assistance for both formative and reflective methods of measurement. The SmartPLS development team is constantly engaged in the process of enhancing and updating the application. This process takes into account user input as well as breakthroughs in the field of PLS-SEM. Releases of software upgrades and bug fixes are made regularly to improve program performance and fulfill user requirements (Hair Jr et al., 2021).

It is essential to be aware that SmartPLS is a proprietary product that calls for the use of a current license to gain access to all of its capabilities and an extensive list of features. However, to facilitate the evaluation process, a trial edition might be made available. On the website SmartPLS, users can access a variety of tools, tutorials, and user guides that are designed to aid researchers in getting the most out of the software they use for SEM analysis (Hair Jr et al., 2021).

Because of its intuitive user interface and widespread use in the academic community, SmartPLS 4.0 has become an invaluable tool. This software makes it simple to create and evaluate intricate models (Ringle et al., 2022). However, because it possesses such a wide variety of capabilities, it also poses several ethical considerations, which postgraduate researchers are obligated to investigate in depth. This literature review digs into the ethical considerations that are involved with using SmartPLS 4.0 for data processing (Ringle et al., 2022). The primary concentration of this investigation is on several facets, including privacy, data integrity, transparency, ethical review, sample size, data quality, and representativeness of the population being studied.

SmartPLS 4.0 Features and Ethical Challenges

Researchers, academicians, and postgraduates who use data analysis tools such as SmartPLS could run into a variety of ethical difficulties, even though there are a wide variety of software solutions accessible for data analysis. These concerns focus on the careful and ethical treatment of data, maintaining the credibility of the study, and adhering to the principle of confidentiality. During the process of data analysis, several typical ethical considerations arise within the postgraduate community (Ringle et al., 2022).

The first problem appears when postgraduate students are tasked with maintaining and analyzing data; they are expected to observe the principles of data privacy and confidentiality at all times. This includes gaining the participants' informed consent, ensuring that the data are anonymized to protect participants' identities, and adopting secure data storage and transfer protections to prevent unwanted access. Before using the data collected from study participants, it is essential to obtain their informed consent first. Students who are pursuing a postgraduate degree are required to articulate and describe the goals of their research, elaborate on the nature of the data that is being gathered, and highlight any potential advantages or disadvantages connected to the study. During the research, participants ought to be able to back out of giving their consent at any time (Latan et al., 2023).

In the field of data analysis, the question of who owns the data and who has the rights to its intellectual property becomes relevant, necessitating adherence to ownership and intellectual property principles that are appropriate for the data at hand. When obtaining data from other sources or organizations, it is necessary to comply with any agreements or licenses that belong to the utilization of the data and the intellectual property of the data. When conducting research and analyzing data, it is expected of postgraduate students that they will respect the highest standards of integrity. This includes abstaining from any type of data modification or falsification while they are engaged in these activities. It is a serious breach of ethical principles to manipulate or falsify data to make it fit one's predetermined ideas or attain one's own desired objectives. Researchers have a responsibility to check the correctness and dependability of the data they use while also being transparent about any limitations or potential biases that may be present in their findings. In the domains of research and data analysis, giving proper credit to the work of others and acknowledging their contributions is of the utmost importance to avoid plagiarising other people's work. Students pursuing postgraduate degrees are required to abide by ethical norms on the citation of sources correctly, the prevention of plagiarism, and the acknowledgment of the contributions made by others to their research endeavors (Latan et al., 2023).

When conducting data analysis, researchers, academicians, and postgraduates need to be aware of the potential for presentation bias, which can take the form of selectively highlighting important findings or omitting results that are contradictory to those highlighted findings (Aguinis et al., 2023; Sarstedt et al., 2016). It is of the utmost importance to provide a representation of the data analysis process that is both fair and open and to ensure that this representation includes both good and negative discoveries. Moreover, researchers, academicians, and postgraduates must look seriously at minimum sample size consideration in their research. For example, with the huge population in their scope of research, there was no excuse to collect data by giving the reason that SmartPLS can measure. Therefore, they must take sample size and statistical power into consideration to guarantee accurate and trustworthy results. It is of the utmost importance to provide a representation of the data analysis process that is both fair and open and to ensure that this representation includes both good and negative discoveries.

The scientific community must place a high priority on upholding transparency in data analysis because doing so is necessary for ensuring reproducibility. Students pursuing postgraduate degrees are expected to make the establishment of transparency and reproducibility in their research activities and data analysis processes a top priority. This will enable their findings to be evaluated and replicated by independent parties. Transparency may be increased and collaboration can be fostered through the sharing of data, code, and documentation.

CONCLUSION

This paper delves into the ethical aspects of quantitative data analysis, underscoring the necessity for researchers to approach matters related to data collection, storage, and analysis with meticulous attention when using SmartPLS. In conclusion, it is necessary to pay serious thought to the ethical implications while utilizing software such as SmartPLS for quantitative

data analysis. Researchers, academicians, and postgraduates who undertake these analyses have a responsibility to be aware of the potential influence that their research could have on the people who took part in the study, the integrity of the data, and the larger scientific community. By adhering to ethical norms, researchers can protect the rights of participants and maintain their well-being while also ensuring the validity and reliability of their findings. Safeguarding data privacy and confidentiality, obtaining informed consent from participants, recognizing and respecting data ownership and intellectual property rights, avoiding data manipulation or fabrication, and ensuring transparency and reproducibility in the analysis are some of the most important ethical issues that must be addressed during the process of quantitative data analysis using SmartPLS. Other issues include recognizing and respecting data ownership and intellectual property rights.

Researchers must place a high priority on the protection of the privacy of study participants by putting into practice methods for the anonymization of data and adopting secure procedures for the storage and transmission of data. The process of collecting and using data requires gaining informed consent, which is vital for protecting the participants' autonomy and rights. This consent must be obtained before data collection and usage can begin. The intellectual effort of others should be safeguarded, and the adoption of appropriate research procedures should be encouraged by ensuring that data ownership and intellectual property rights are respected. When analyzing quantitative data, maintaining integrity is of the utmost importance. Researchers have a responsibility to emphasize the accuracy and dependability of the data they collect, and they must publish findings that include both positive and negative results while avoiding the appearance of reporting bias. Sharing data, code, and documentation makes it easier to promote transparency and reproducibility. This also makes it possible for others to verify and improve upon research efforts that have already been conducted.

In addition, researchers, academicians, and postgraduates had to take sample size and statistical power into consideration to guarantee accurate and trustworthy results. In research, the utilization of an appropriate sample size is essential for assuring the reliability and generalizability of the findings, whereas the utilization of an inadequate sample size might lead to incorrect results and potentially misleading interpretations. Researchers, academicians, and postgraduates can make substantial contributions to the advancement of knowledge by adhering to ethical norms. Moreover, this helps to foster integrity and credibility within the scientific community. Researchers who seek advice from mentors, supervisors, and research ethics committees can improve their capacity to handle ethical problems effectively. In essence, ethical data analysis methods using SmartPLS go beyond merely employing statistical procedures and demonstrating proficiency in software. The adherence to these principles demonstrates a dedication to maintaining ethical standards in research, protecting the rights of participants, and providing findings that are both important and reliable in the scientific community.

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