

# Innovations

## Path to Understand Research Methods and Scientific Language

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### Abstract

*This paper embarks on a classical scientific journey to explore and elucidate the intricate world of research cognition and methods. Delving into quantitative and qualitative methodologies, highlighting their features, and dispels misconceptions and erroneous assumptions surrounding them. The discourse extends to examining the pros and cons of these approaches, clarifying terminology related to case studies and population size. The work advocates for revisions in referencing styles and argues against the use of a, b, c format in in-text citations. The paper also clarifies why experimental research cannot be conducted by social sciences due to its inherently limited control power features, compared to the natural sciences. Through the navigation of this path, the ultimate goal is to demystify research methodologies and cultivate a deeper comprehension of scientific language.*

**Keywords:** *Quantitative Research, Qualitative Research, N-Study, n-Study & Population Size*

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### Introduction

Research is a broad and all-encompassing concept that traverses across academic disciplines and real-life endeavors. The journey to comprehend research methods and scientific language is akin to navigating a labyrinth of knowledge. Academic research stands as a beacon, distinguished by its adherence to scientific principles and rigorous methodologies; guided by well-established methods and theories. A hallmark of academic research is the scrutiny it undergoes through processes like blind or open peer review, which is essential to validate its status as scientific work. The land landscape of research, features a crucial dichotomy: quantitative and qualitative methodologies. Philosophically, debates between both approaches have ignited passionate [but scientific] arguments for and against, with proponents of each methodology ardently advocating for their superiority.

Quantitative theorists often emphasize the generalizability of research findings, while qualitative theorists argue for the importance of non-numeric data and the ability to conduct research when primary data collection is unfeasible. This paper embarks on a quest to untangle the webs of misconception surrounding research methodologies and proposes a definitive criterion for distinguishing between them, rooted in data presentation. It also scrutinizes the burgeoning trend of mixed-method research, evaluates the merits and demerits of both approaches, and contests the perception that experimental research within the social sciences is inherently constrained compared to the natural sciences.

### Quantitative vs Qualitative

Though guidelines are well established and ethical protocols are instituted, the point of departure in the past was conflictual. Several scholars, on the one hand, argued firmly that a research design should be quantitative in nature. Comparative Political Theorists fervently hold that generalization of research

findings is suitable only for large studies. On the other hand, a chunk of other scholars - Qualitative Theorists, lukewarm the attitudes put forth by Quantitative Theorists. The main point put forth by qualitative scholars was that not all research topics have luxuries to collect primary data. Thus, if science focuses only on the collection of primary data, a huge portion of knowledge creation would be missed. Conducting research on, let's say the social life of astronauts, it is almost[financially] impossible for a researcher to travel to space to collect data. Also, even if a researcher decides to visit astronauts when they return back to earth in order to collect data, how many of them would the researcher have access to? The number would be very low and in some cases, it may be a 00% chance. Meanwhile, there are several avenues where astronauts provide information about life in space. Won't it be plausible for researchers to search the secondary pieces of such information and try to make sense from it? The same is the case with several other issues like researching legislative, judiciary, etc. For further readings on where and when these two staunch research traditions converge and diverge, see: Fielding, Schreier, Kelle, Mayring, Cupchik, Witt, Shank, Sanin, Janetzko, Alisch, Saludadez, Garcia, Westmarland, Schmitt, Mees, Laucken, Kuiken, Miall, Kleining, Jakob (2001). The huge number of co-authors in the work expresses the depth information it carries. Another good scientific piece is Bryman (1984) which delved into the nuances and nature of knowledge production of these two methods.

The above questions were more challenging to Quantitative Theorists to answer, and Qualitative Theorists successfully established themselves as a research design. Quantitative Theorists failed to see that qualitative research equally feeds on quantitative research, and often, at times, conducts comparative studies. Despite all these, a lot of researchers are still unable to give a clear cut distinction between quantitative research and qualitative research. Some Comparative Political Theorists wrongly think that quantitative research deals with a large case study, while qualitative research focuses on small case study. But such arguments are shallow because it has never been established practically; there are quantitative studies that focus only on one or two countries, meanwhile, there are qualitative studies that focus on 5 or more case studies. Based on this, it is clear that the argument about size should be dismissed with immediate effect. Such an argument is unscientific and it has overstayed its welcome in academic space. If asked what is the minimum or maximum size of population or case study a quantitative research should have? There is no answer for this. According to Hackshaw (2008) the size of a study is determine by the main objective of the study. This denotes, study size is not determined by research design - quantitative and qualitative.

On this note, what truly can be used as a clear cut philosophical and scientific distinction between quantitative and qualitative research? The answer to this lies in their mode of data presentation. Quantitative research presents data with the use of numbers/statistics, while qualitative research does not use numbers/statics; it uses words to present its own data. This implies that, both quantitative and qualitative methods are capable of collecting raw data for analysis. Also, the adage associating qualitative research of focusing solely on secondary data is debunked, and more interestingly, there are quantitative studies that solely depend on secondary data. A scholar researching financial related issues may decide to collect secondary data from financial institutions and analyse them with statistical methods. Likewise a person researching on migration decides to obtain secondary data from the UN and other migration agencies. Because a study focused solely on secondary data, can we say it is a qualitative study? NO. It takes us back to the previous explanations, sources of data collection (primary and secondary) does not communicate whether a research is quantitative or qualitative. The mode of data analysis is the only scientific and reliable criterion to determine whether a study is quantitative or qualitative. The work of Schedler & Mudde (2010) illustrates that quantitative [comparative politics] research focus on numeral presentation of data. This also corresponds or concur with the panorama of Yilmaz (2013). Even though Yilmaz tried to reject the simplistic distinctness to attribute non-numerical nature to qualitative research, his explanation could not change the original non-numerical meaning of the concept.

In recent times, scholars are employing a mixed method for research. It is increasingly becoming very common to see studies where authors state that their research is both quantitative and qualitative (Venkatesh, Brown, & Bala 2013). All researchers make use of secondary data and this is indisputable - to simplify it better, literature review is one of the main bodies of research. Based on the distinction between quantitative and qualitative research given above, a mixed method research may present certain primary data like those gathered from Focus Group Discussions, observations, and Semi-interviews, and used numbers/statistics for data obtained with questionnaires. The reason why researchers increasingly state in their methodology that their research adopts a mixed method is because an understanding of both concepts helps researchers to manoeuvre complex and diverse target populations as these two methods assist each other to fill gaps that may occur in large studies if a mixed method is not used.

### **Advantages and disadvantages of Quantitative vs Qualitative**

The axiom that scientific findings can be generalized has gone a long way to influence the size of studies. Why should a researcher conducting a research, let's say on Africa or Europe, study all African/European countries when his/her research can focus on a few countries as case studies and later generalise the research findings on the whole continent? Contrary arguments opined that generalization in such a case may be ineffective. Though this is true, it is not entirely true. Reason being that, generalisation of findings even in the countries that were used as case studies may equally face challenges. The argument from none case study countries is not sufficient enough to prevent the generalisation of findings. It may only be considered sufficient enough, only if the case study countries are not within their geographical location. Meaning, an African rejecting the generalisation of a study conducted in Europe (and vice versa) is a solid ground to prevent the acceptance of generalisation. Apart from this scenario, generalisation is permitted.

With this, Quantitative Theorists can no longer claim that studies carried out with the use of their method have a higher propensity for generalisation than that which employs a qualitative method. This clarification is very important because, it has been shown in this work that, both methods can rely either solely on primary or secondary data; none has monopoly over types of data or data sources. The rate of accessibility to data is one of the key determinants whether a researcher should use either primary or secondary data. Other key determinants are 'Finance' and 'Time.' These three variables are the major determinants. Any other factor may have little or no real determinant power to direct on data type. The work of Heyink & Tymstra (1993) which tries to limit the modesty of qualitative research within the confines of social science has been proven by this paper not to be true. There has been an increasing number of natural scientists engaging in qualitative research. The main reason why people often get confused and establish elasticity to the scope of qualitative method is because, they do not know the key difference between quantitative and qualitative research methods. This study has clearly illustrated and answered the puzzle; since both methods engage in empirical studies (primary data collection), likewise, secondary data (as elaborated in the previous paragraphs), their modes of data presentation is the only factor that distinguishes the two scientific research traditions.

All studies carried by quantitative scholars can be carried by qualitative scholars. But not all studies carried by qualitative scholars can be carried by quantitative scholars. For example, a historical research; focusing on studying ancient times e.g. Roman Empire, the Life of Jesus, the Thirty Years Wars in Europe, Pre-colonial Africa, Slavery and Slave Trade. These eras are in the past, getting primary data is almost impossible. But is it really true that a quantitative study cannot be carried out for the past because only secondary data are available? The answer is: NO. Like earlier illustrated, a quantitative research can obtain secondary data/statistics and analyse them, and present the findings in statistical formats. This takes us back to the earlier arguments put forth in this paper which holds that; only the mode of data presentation accounts for a true unique distinction for these two. Hence, all studies carried by qualitative tradition can be carried with quantitative tradition and vice versa.

### **Case Study and Population Size**

The manner in which some researchers present their case study and/or population size is continually becoming an unscientific normalcy (see Braumoeller 2003; Lieberman 2005; Munck 1998; Collier 1993). In scientific research, some words, and letters are well established and designed to communicate to readers what they stand for. For instance “N” and “n”. These two letters stands for different sizes:

N - study: it implies that a research is focus on a large study

n - study means a small study.

Likewise,

N- population denotes a large population under study

n - Population implies a small population under study.

Sadly, it is common to find research works where scholars write: Large-N study. Small-N study, Large-N population, Small-N population. This type of intentional error occurs when researchers fail to familiarise themselves with scientific research lexicons. Even from a literal understanding, Small-N cannot be Small-N. Grammatically, the rightful form would be [small] “n”. The alphabet has capital “N” and small “n”. But in research, these two: “N” and “n” are used to communicate the size of a study or population as demonstrated above. Thence, researchers should stop writing Large-N and Small-N. Simply use “N” and “n” (Pelekeh 2023). It is worthy to note here that, during the presentation of a work, a researcher may say that his/her work focuses on a Large-N or Small-n (not Small-N) because verbally, people would understand what you say. But these should not be written as such in the work. The reason why some researchers get confused with this nuance in science is because they are unable to distinguish work presentation (verbal communication) from the written work (meant for readers to read). Which explains why they tend to wrongly write what they speak. It is of utmost importance to recognise this difference and exhibit each where they are rightfully appropriate. The fact that this error may be found in the works of some renowned scholars does not mean that the format is correct. It is an error that deserves scientific attention and correction, and this paper has done that. For further readings on case study, see: Levy (2008) and Odell (2001). If a researcher ever gets confused on this, and wants to avoid making errors, simply write: large study, small study, large population or small population. Hackshaw (2008) efficiently used “small study” in his work.

### **Technicality and Referencing**

The idea of using an author’s sure name rather than given name is old fashioned and should be eliminated by all the major authorities setting the pace - APA, Chicago, MLA, etc. Any argument in support of the continuous use of surname as first name for referencing and in-text citation is ungrounded; why should an author’s work be attributed more to his family name rather than his/her given name? I think the end to this format should be soonest. Because authors are left powerless on this issue, it has forced many to change the order of their names. This explains why it is possible today to see an author with two different order of names in works he/she has published over different periods of time.

Publishers do not have rights to reject the order of names given to them by an author. And since this is increasingly becoming a trend, the format of in-text citation and references/bibliography should be changed - given names should first, and surname last. In a similar case, but in another context, some scholars have names that they do not want mentioned in their publications, while some prefer to always initialise such names. I think this issue warrants the authorities in charge of producing styles of referencing to re-adjust their preference in relation to the order of names. The fact that different institutions in charge of referencing have different referencing styles, yet, all the numerous styles are scientifically accepted, means that arguments for an author’s work to be attributed more to his given name{s} than family name is a necessity which is possible and easy to achieve.

The argument for using a, b, c, d, e, etc. for in-text citations for works published by the same author in the same year is misleading. It is misleading and very wrong because researchers only search for works that are related to their studies. Getting the right sequence on which work was published before is not really relevant. Because researchers search and make use only of literature that is related to their studies. An author may have published, let's assume, 4 works in the same year, the probability that a researcher may come across only one or two of those publications is high. Perhaps, only the third and last work are related to his/her study, and the researcher does an in-text citation thus, John 2004a. But the cited work was not the first publication of the said author in that year. The researcher uses the a, b, c, etc. based on the work he/she has accessed. Researchers are not concerned about searching for the total number of works an author has published in the same year in order to know which work was published first, second, third, fourth, etc. In this sense, the a,b,c format of in-text citation is providing rooms for researchers to pass out wrong knowledge.

Just the name and year of publication is enough. A reader interested with an in-text citation goes to the reference page and the full reference of the work. The same applies even when the a,b,c format is used, a reader would still have to go to the reference page to get the full reference. In a nutshell, because the a.b.c format of in-text citations provide means of wrongful presentation on the sequence on which an author's work was published, is sufficient enough to scrap out the format.

### **Sample Size and Sample Population**

Understanding the significance of sample size and sample population before embarking to a field for data collection is an unavoidable necessity for any researcher if s/he wants to attained research objectives. Sampling helps to reduce redundancies, time and resource wastage, by directing a researcher to focus on a target population (Lakens 2022). Between quantitative and qualitative researches, there should be no differentiation in determining sample size and sample population. Both utilizes the same procedures and developed methods. The most common used formula to determine sample size was formulated by Yamane (1967):  $n = N/[1+N (e)^2]$ . In regards to selection biases and how cases a researcher chooses affects research findings, see Geddes (1990).

Most contemporary researchers are avoiding the use of hypothesis in their works. There is no need to use a hypothesis if you are not going to test it. Whether using hypothesis or not, it has no scientific discredit to a research. If a research focus on an n-study where all the population can be sampled, there is no need to use a hypothesis (Lakens 2022). This is because, after the study, there would be no population to make a generalisation on. Based on these two criterion, on the one hand, the decision to use or not to use a hypothesis is a matter of choice, and on the other hand, it is determined by the study size (N or n) and the total number of population under study. The first option would overrides the second (though most supervisors often insists their supervisees should make use of hypothesis). Apart from student researches, the first option would always have a muscular influence than the second option.

### **Experimental Research and the Two Sciences (Natural and Social)**

A wave of debates has occurred from time immemorial concerning whether experimental studies should be left for Natural Science alone. But some Social Scientists have never been contented with this line of argument, even though they are unable to clearly argue why social sciences should conduct experimental research. The main reason why social sciences cannot successfully conduct an experimental research is because, it deals with variables that cannot be held constant. Unlike the natural sciences, variables like: temperature, humidity, wind, purity of chemicals, water level, light, volume, sound, voltage, etc, can all be held constant in a lab. It is very wrong for a social scientist to say he/she can carry-out an experimental study; nothing can hold humans and scientifically conditioned them to

be constant, because behaviors, feelings, perceptions, and attitudes will always change due to changes in environment and time. Collier (1993) tried to explain why social scientists should conduct experimental research. However, he was unable to ascertain how this can be carried out. Despite this, surprisingly, he refused to accept that experimental research can only be carried out by natural scientists. Ragin (1987) delved into the issue and after several illustrations sorting for possibilities for social scientists to achieve the same results like natural scientists do with experimental research, he found that, this is not possible. Ragin concluded that social scientists can not carry out an experimental research and suggest that they should abandon it. His explanations are true and clear as it has been argued by this paper.

Humans cannot be put under laboratory conditions in the same ways the variables mentioned above are kept. The only humans that are constant are people who are on comma. The only variables that are considered to be constant for social scientists are controlled variables; this is a variable that a researcher is not interested in, by the/she monitors it to see if it will cause an effect on his/her independent and dependent variables. For example, conducting a research on the effect of public policy in Canada. The independent variable here would be the Canadian government, and the dependent variable would be social welfare. The control variable may be the United Nations (UN). Though the UN is not the concern of the research, a researcher may decide to monitor the UN to see if it is causing changes to occur on the Canadian government and/or social policy. This shows that, the way a social science variable is held constant is different from that of the natural sciences. Likewise, the nature of the variables varies. It explains and justify why Rogoski (1995) articulates that using the right theory for a research is very important because if an inappropriate theory is used, it would leads to inaccurate results or falsify findings, and hypothesis can not be properly tested in such circumstances. Thereby, making it impossible to scientifically test any hypothesis and get a reliable result. In the same alignment, if social scientists employ experimental research, it would lead to inaccurate or falsify results.

### **Evaluating the Relevance of a Work**

When evaluating the importance of a work, statistics obtained from the total number of time it has been cited should not be given full accreditation and reliance. The number of time a work has been cited does not give a true picture of the relevance of the work. This is because, a work that has been criticised several times by numerous publications would definitely have a high statistics for citation. It is therefore, imperative not to solely rely on the number of times a work is cited to determine its potency. Since it is very difficult to read all the works where a paper has been cited, by default, reading through a work in comparison with a few other works in the same domain may provide a more and balanced evaluation than depending only on statistics from citations. While taking into considerations, the potentials for personal biases from those that may be selected to perform the task. There are always limitations in performing any act, notwithstanding, measures should and must always be taken to minimise shortcomings. Going through the works that has cited a work is imperative and of utmost importance. It gives a direct evaluation a work, if arguments are for and not against, this can be considered on a positive ends means.

### **Conclusion**

Academic research is distinct from other researches in that, all academic researches are considered scientific research. Thereby, implying there are well established methods and theories that guide such a research. It explains why academic works (books and articles) are expected to go through a sort of review; either blind peer review or open peer review. Irrespective of the type of review used, the main reason for review is to ensure that a research qualifies to be accredited with the status of being a scientific piece. In a world of ever-evolving research methodologies and practices, it is essential to clarify the distinctions between quantitative and qualitative research. While historical and philosophical

debates have led to misconceptions, the true differentiator lies in their expressive styles of data presentation. Quantitative research employs numerals and statistics, whereas, qualitative research relies on words to convey its findings. Discussions surrounding the usage of primary and secondary data sources should not be conflated with the quantitative versus qualitative debate. Both approaches can use either data sources, thereby, making it not to be a real subject for debate or contention. The paper advocates for a reconsideration and a paradigm shift in referencing styles; advocating for the use of authors' given names, and surnames should be abbreviated and not the other way round. It also questions the relevance of the a, b, c format for in-text citations when citing multiple works published by the same author in the same year; arguing that it can lead to erroneous assumptions about order of publication. Thereby, leading to the generation of wrong knowledge.

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### **Ethics**

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