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Research Methodology as a Calibrator for the Validity of Scientific Research Results

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ABSTRACT

This article discusses research methodology as a calibrator (Calibration Standard) to ensure the validity of research results. Research is an activity of searching for information, data, and facts to support a perspective of truth or as a reference for the novelty of knowledge that continues to evolve with the advancement of human civilization. Therefore, a calibration standard is needed to regulate the roadmap in searching, collecting, and processing information, data, and facts into research results that can be scientifically accountable. The legitimacy of research results can only be achieved when the prerequisites of research, which include the background of the problem, formulation of the problem, research objectives and benefits, conceptual framework, and basic research theories, have been calibrated with the methodology to be used, ensuring that the results are more accurate, relevant, and can be considered valid.

Keywords: research methodology, calibrator, validity of research results.

INTRODUCTION

The rapid development of human civilization in line with the fast-changing times has formed a paradigm regarding the challenges that must be faced. Science, which essentially represents humanity's effort to describe the issues of the world and its surroundings, should rightfully serve as a solution to the increasingly complex global problems. This aligns with the nature of science, which emerged alongside human curiosity born out of demands and interests. Religious perspectives explain that the Creator's revelation of the natural world and its contents to the first created human served as the foundation of knowledge (Karim, 2017).

Furthermore, from a philosophical perspective, there is a distinction between the substance of science and knowledge, although they are interconnected and complement each other. Science is built upon objective scientific procedures that are testable and measurable. On the other hand, knowledge is acquired through reasoning, experience, and intuition, and it may not always take the form of science since some knowledge cannot be empirically proven. However, science is a subset of knowledge since it undoubtedly originates from one of the sources of knowledge. In other words, science serves as the legitimization of the validity of knowledge. Therefore, scientific knowledge is the result of reasoning, experience, and intuition that can be observed, tested, measured, and has been put into a system of information. (Nurroh, 2017).

In the era of disruption, such as the present, massive and unpredictable changes pose challenges to the advancement of scientific knowledge. One way to address these challenges is through research activities aimed at gathering information, data, and facts to test a perspective of truth and, at the same time, serve as a reference for new knowledge. Furthermore, research is also a prerequisite for developing scholarly works to obtain educational degrees, be it at the Bachelor's, Master's, or Doctoral levels, as an effort to regenerate scholars who are expected to contribute positively to the interests of science and practical applications. It is through

the ideas generated in these scholarly works that they are envisioned to become references for thinking, decision-making, and policy formulation.

Mukti Fajar ND (2013), research can be described as a series of activities conducted based on its own principles, which encompass consistency, systematicity, and measurability, aimed at obtaining data and facts that will subsequently be analyzed to produce conclusions expected to contribute to the thinking process in education and practical purposes (Arliman S, 2018). Given the significant importance of research, the selection of an appropriate methodology as a calibration standard becomes a necessity to ensure alignment between the concepts, mechanisms, procedures, objectives, and benefits of the research, thereby guaranteeing the validity of research results.

In general, research is conducted to seek information, data, and facts based on needs, interests, or mere curiosity. Raco (2010: 5) describing research as a series of activities that follow specific scientific procedures, are systematically planned, and have practical or theoretical objectives (A & Abdillah, 2019). The definition of research is explained as a way to acquire knowledge through two different perspectives: the positivistic perspective known as the quantitative method and the phenomenological perspective or qualitative method. The quantitative method employs the assumption that truth is singular and universally applicable, known as the nomothetic perspective. On the other hand, the qualitative method is contrary to the quantitative method, employing the perspective that truth is not singular but dialectical. Hegel later simplified the concept of dialectics into three constructs known as a trilogy, comprising thesis, antithesis, and synthesis (Jaedun, 2011).

METHOD

The type of research in this article is a literature review. The research subject comprises academic sources, including books and articles, relevant to the title of this article. The steps involved in composing this article are as follows:

1. Data sources: The literature or reference materials used in this research include books, scientific journals, articles, research reports, and other relevant documents.
2. Literature search method: The strategy employed to search for and select literature relevant to the research topic involves manual selection based on research methodology criteria.
3. Inclusion and exclusion criteria: The criteria used to select literature included in this research and to sort out literature that should be included.
4. Data collection process: The process begins with collecting relevant literature, then recording and organizing it systematically for analysis.
5. Analysis method: The analytical approach used to process data from the literature includes content analysis techniques, thematic analysis, and other relevant methods.
6. Validity and credibility: This section discusses the steps taken to ensure the validity and credibility of the literature review research, such as selecting reliable sources and applying appropriate analytical approaches.
7. Research limitations: The literature review is limited by a specific time period and certain types of literature that are included or excluded.

The important points that need to be discussed in this study are related to:

1. Research Methodology Concept, which discusses the definition, types, and aspects of research methodology;
2. Calibrator (Calibration Standard), which addresses the definition, purpose, and benefits of calibration;
3. Validity of Research Results; and
4. Research Methodology as a Calibrator (Calibration Standard) for the validity of research results.

All these points are supported by relevant data and information to strengthen the argument about improving the validity of research results through research methodology management.

RESULT and DICUSSION

Research Methodology

1. Definition of Research Methodology

Literally, the term "methodology" consists of two syllables, namely "method" or way, and "logos," which means science. According to the Kamus Besar Bahasa Indonesia (KBBI), methodology is the science of a method. Hence, it can be concluded that research methodology is a specialized science that studies the scientific ways or procedures of conducting research. In other words, methodology is a system used to rationalize information from observations and scientific thinking, which is then presented in the form of data for subsequent analysis. The results of this data analysis become the basis for discussions used to formulate conclusions in testing a perspective or serving as a reference for new knowledge (Achmadi, 2011). Therefore, research methodology can be summarized as an instrument that specifically deals with various methods used in conducting research.

2. Types of Research Methodology

Research methodology is a branch of science that specifically studies scientific methods or ways of conducting research. The essence of research methodology is oriented towards the methods that have been references and literatures in conducting research. According to Sahir (2022), there are two types of research methods that have been commonly used as references in conducting research:

a. Qualitative Method: This research process is based on the perspective of phenomena or problems for analysis and description using narratives summarized in the research conclusions with principles of generalization.
b. Quantitative Method: This research process is based not on perspectives but on numerical or quantitative information, with a wide population, where data processing utilizes statistical analysis.

3. Aspects of Research Methodology

As a research instrument, methodology naturally encompasses standard aspects that must be fulfilled to ensure that the research proceeds as planned and that its results are relevant and well-directed, as stated by Wisnu Jatmiko, (2016), Faculty of Computer Science, Universitas Indonesia in the "Guidelines for Writing Scientific Articles." These aspects are as follows:

a. Estimation of the time range of implementation, which involves determining the start and end time of the research.
b. Research location, consisting of a brief explanation of the thematic place of research, its characteristics, and the reasons for selecting the research location.
c. Population and research sample, where population refers to the entire objects/subjects that will be studied, which can include living organisms, objects, or events. The sample, on the other hand, is a portion or representation of the population chosen using specific techniques.
d. Sampling technique, which is the method used to determine or select the research sample, described by Whardhany under two constructs as depicted in the table below:

Table 1. Sampling Techniques.

Probability sampling or commonly known as random sampling is a sampling method where all elements of the population have an equal chance of being selected as research samples (randomly).	Non-probability sampling, also known as non-probability sampling, is a sampling method where not all elements of the population have an equal chance of being selected as samples.
1. Systematic sampling or based on sequentially determined numbers by the researcher. 2. Area sample or cluster sampling is the determination of samples based	1. Quota sample is the sampling method where the quota is predetermined by the researcher. 2. Purposeful sample is the sampling method based on specific considerations or characteristics.

on randomly selected areas. 3. Simple random sample is not based on any specific structure and is applicable only to the same/similar population. 4. Balanced stratified random sample is the random sampling based on strata within the population. 5. Unbalanced stratified random sample is the random sampling based on strata, but the sample size may not be equal.	3. Incidental sample is the sampling method where participants are chosen coincidentally, meaning whoever the researcher encounters. 4. Exhaustive sample is the use of the entire population as a sample due to its very small size. 5. Snowball sample is the continuous sampling method until a sufficient number is obtained.

Calibrator (Calibration Standard)

1. Definition of Calibration

According to Indonesian Dictionary, calibration refers to the characteristics or indications that represent the division of a scale. Calibration is conducted to provide assurance of the conformity of a measuring instrument to established standards. According to Keren (1991), calibration is a series of activities involving comparison, checking, and matching the assessment of performance with its reflective metacognitive monitoring process, which can provide information about someone's knowledge status or strategies (Bol & Hacker, 2012). Calibration can also be a method used for data collection and additional information to serve as a basis in describing aspects related to a procedure to enhance accuracy and reliability in estimating population parameters (Koyuncu, 2018). Population parameter estimation is a method to determine the confidence level and significance level of the estimated sample size considered to represent the observed population, or in other words, population parameter estimation is the value of sample estimation for the population (Nugroho, n.d.).

Based on previous studies, it is stated that the accuracy of an estimation heavily depends on the optimization of various aspects that need to be fulfilled. The method to address this issue is through calibration. Calibration estimation is a method that uses additional variables to adjust the original design weights to improve the precision of the survey's estimation of population parameters. Deville and Sarndal (1992) first introduced calibration estimators in survey sampling, and the calibration estimation has been studied by many survey statisticians (Etebong P., 2015).

2. Objectives and Benefits of Calibration

Every activity has its own objectives and benefits. According to Fitrya et al. (2017), the objective of calibration is to ensure that each design or measuring instrument conforms to the established standards (accuracy). On the other hand, the benefit of calibration is to ensure that each design or measuring instrument is in accordance with its specifications (precision). Thus, the objectives and benefits of calibration are to maintain the accuracy and precision of a design, ensuring that it adheres to the established standards.

Validity of Research Results

According to Indonesian dictionary, validity means in accordance with the proper way, valid, or authentic. There are three levels of validity, namely content validity, construct validity, and criterion validity. Coaley (2010) explains that content validity is oriented towards the parts within a design, with Azwar (2005) describing rational analysis as the primary approach in this validity. Furthermore, Devellis (2003) explains criterion analysis as the description of the correlation between a design and the underlying theory. Meanwhile, construct validity is a comprehensive description of the suitability between the theory used in the design (Ihsan, 2016). Based on these definitions, it can be concluded that validity is the level of accuracy or appropriateness obtained through the

assessment or calibration procedure of each element in a design.

Research Methodology as a Calibrator for the Validity of Research Results

Calibration matrix is a tool used to ensure the accuracy and reliability of a measurement system or instrument. In the context of calibration, the matrix serves as a known reference standard and can be used to compare and correct measurement results from other devices.

For example, in the calibration of measuring instruments such as thermometers, pressure gauges, or spectrometers, the calibration matrix may contain a series of well-known values. The instrument to be calibrated is then used to measure the same values, and the results are compared with the known values in the matrix. If there are discrepancies between the instrument's measurement results and the expected values, corrections can be applied to ensure its accuracy.

The application of the calibration matrix is not limited to physical instruments but can also be used in various contexts, such as the calibration of mathematical models or statistical modeling. For instance, in risk analysis or economic forecasting, the calibration matrix can be used to ensure that the statistical or predictive model provides results that align with well-known historical data.

Based on the discussions about research methodology and calibration, the following is presented as the research methodology and calibration matrix:

Table 2.
Methodology Matrix as a Calibrator.

Aspect	Research Methodology	Calibration
Objective	To ensure that the research design complies with the established standards, including methods, approaches, types, and research sampling techniques (accuracy).	To ensure that each design (measurement instrument) conforms to the established standards (accuracy).
Benefits	To ensure that the research design aligns with the research title (precision).	To ensure that each design (measurement instrument) conforms to its specifications (precision).

Through the use of calibration matrices, we can obtain higher levels of confidence in the measurement results or models generated by the system. This is crucial in various fields, including scientific research, manufacturing industries, medicine, and many others, where measurement accuracy and reliability are paramount.

However, it is important to remember that in the context of "Methodology Matrix" as a calibrator or anything related to the concept, it is necessary to seek more specific references or contact experts in the relevant field to obtain more accurate information.

CONCLUSION

Based on the discussions above, it can be concluded that research methodology and calibration have the same objectives and benefits, which are to maintain accuracy and precision, directly influencing the validity of both research findings and measurement results. Therefore, it is entirely appropriate to designate research methodology as a calibrator or research calibration standard.

Research methodology, as an instrument, is a responsible literacy for determining the validity of research findings. Hence, the role of academic and teaching practitioners is crucial in maintaining and enhancing researchers' understanding and knowledge of research methodology. This is particularly important considering that in the process of sharing knowledge, the acceptance and understanding of each entity may not be the

same, and information is like a perspective construct. Even a slight shift in meaning can result in greater gaps or disparities. Therefore, through this journal, the researchers hope to receive advice and input that can be used as a reference for future research methodology journal writing.

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