

# Quality and quantitative approach in engineering

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The objective of this paper is to propose a study and discussion on the use of quantitative and qualitative approaches in engineering research methods and design. In this introduction it is to provide a thorough presentation on the aspects of qualitative and quantitative approaches for engineering research. As such, the scope of this paper covers a broad range of topics and it is important that the engineer to perform successful experiments, and it is equally important that to understand and be able to estimate the accuracy of the engineering investigations through these approaches.

In the past research approaches in engineering have accumulated to a point at which the engineers and investigators have many selections. For those designing an engineering research proposal, it is recommended that a general framework be maintained to accommodate advice about all facets of the study, from assessing the general theoretical ideas behind the investigation to the detailed data collection and test procedures. Using an extant framework also allows engineering researchers to lodge their plans in design ideas well grounded in the literature and recognized by audiences that read and support the proposals for engineering research.

The focuses in this paper are on the use of quantitative and qualitative approach and the comparisons and contrasts in the characteristics as well as the significances of these approaches within the field of engineering design research. 2. Background This section suggests the background and the framework of quantitative as well as the qualitative approaches for engineering research. The theoretical assumptions about what constitute the knowledge claims; the general procedures of research are the strategies of investigation; and detailed procedures of data collection analysis are called <https://assignbuster.com/quality-and-quantitative-approach-in-engineering/>

methods. . 1 Outline of Quantitative Approach to Engineering Research A quantitative approach in engineering is defined as one in which the engineer mainly employ postpositivist claims for developing knowledge. The knowledge are called cause and effect thinking, reduction to specific variables and hypothesis and questions, use of measurement and observation, and the test of theories. Quantitative approach employs strategies of analysis such as experiments and opinions, and collects information on predetermined instruments that yield statistical information.

In this scenario the engineer tests a theory by specifying narrow hypotheses and the collection of experiment data to support or refute the hypotheses. An experiential engineering design is applied in which attitudes are assessed both and after an experimental treatment. The data are collected on an instrument that measures attitudes, and the information collected is analyzed using statistical execution and hypothesis testing.

2. 2 Outline of Qualitative Approach to Engineering Research. A qualitative approach in engineering research is one in which the engineer makes knowledge claims based primarily on constructivist perspectives and that is, the multiple meanings of individual experiences, meanings evidently and historically constructed, with intent of developing a theory or pattern, and that is issue-oriented or collaborative. It also uses strategies of investigation such as narratives, phenomenologies, ethnographies, grounded theory studies, and case studies. The engineer collects open-ended, emerging data with the primary intent of developing ideas and design from the data.

In this situation the engineers seek to establish the meaning of a phenomenon from the opinions of participants. This means identifying a culture-sharing group and studying how it developed shared patterns of behavior over time (i. e ethnography). One of the key elements of collecting data is to observe participants' behaviours by participating in their activities. For this research approach, the engineer seeks to examine an issue related to oppression of individuals. To study this, the approach is taken of collecting stories of individual oppression using a narrative approach.

Individuals are interviewed at some length to determine how they have personally experienced feedback. 3. Comments and discussion Different form of investigations must be performed on all experimental data. The examination may be a simple verbal appraisal of test results or a complex theoretical analysis of errors involved in the experiment and matching of the data with fundamental principles. The discussion considers the analysis of data to determine errors, precision, and general validity of experimental measurements. The experimentalist should always know the validity of data.

In order to specify the performance of an amplifier, an electrical engineer must know the accuracy with which the appropriate measurements of voltage and distortion have been conducted. A nuclear engineer must know the accuracy and precision of many instruments to make radioactivity measurement with confidence. In the quantitative approach like experiential analysis, design engineers have drawn on their own experience of designing to give explanation of aspects of design. Design researchers are also concerned about the lack of acceptance of their ideas by practicing engineering designers.

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By involving in the engineering research, it is more likely that the outcome of the research will be taken up because of the shared ownership of the knowledge produced by quantitative approach. On the other hand, in the qualitative approach, historical analysis is the discovery from past records a description of explanation for invention in the past. Scientists divide data into primary and secondary sources. Primary source include eyewitness and contemporary records such as instruction manuals and the personal notes.

Secondary sources are summaries and reports of invention by other scientist or engineers. The role of historical analysis in qualitative approach is to provide theoretical base for the current research. Development in design due to the introduction of new technology can be compared to the development in the past. During the last decade, the strategies of investigation affiliated with quantitative approach were those that invoked the post-positivist perspectives. These include true experiments and less rigorous experiments.

More recently, quantitative strategies involved experiments with many variables and treatments such as factorial and measure designs. They also included elaborate structural equation models that incorporated paths and the identification of the collective strength of multiple variables. The two critical strategies of investigation in the quantitative approach are test experiments and surveys. Experiments include authenticated test experiments, with random assignment of subjects to treatment conditions, as well as quasi-experiments that use non-randomized design.

Survey includes using questionnaires and structured interviews for data collection to gather the feedback from the past records. In the qualitative

approach, the experiment results those are usually rich and detailed, offering many ideas and concepts to inform consumers your new invention.

Qualitative approach can display how the product user feel and think, but cannot tell how many of the audience feel and think that way. Qualitative approaches in research results are considered thought of as themes; they should not be reported as percentages, subjected to statistical analysis or projected to a wider population.

The main reason is because the participants do not make up a randomly selected representative sample and not all participants are asked exactly the same. This approach offers flexibility as far as timing is concerned and exhibits an important challenge for engineering design. 4. Conclusion The following points can be considered and taking note when using the quantitative and qualitative approaches for engineering research: 1.

Examine the data for consistency. No matter how hard an engineer tries, there will always be some data points that appear to be grossly in error.

For instance, if adding heat to a container of water, the temperature must rise, and so if a particular data point indicates a drop in temperature for a heat input, that point might be eliminated. The data should follow common sense consistency. If many data points in the experiment fall in the zone of "inconsistent". The entire experimental procedure should be investigated for gross mistakes and miscalculation. 2. Perform a statistical analysis of data. A statistical analysis is only necessary when measurements are tested several times.

If this is the case, make estimates of such parameters as stand deviation or etc. 3. Estimate the uncertainties in the test results. The engineering researcher should bear in mind the influence of different variables by the time the final results are collected. 4. Anticipate the test results based on theory. Prior to obtaining correlations of the experimental data, the researcher should review the theory affiliated with the subject and glean relevant information that will indicate the trends the results may take.

Critical dimensionless groups, pertinent functional relations, and other information may lead to a fruitful interpretation of data. 5. Correlate the data. The investigator should make sense of the data in terms of physical theories and on the basis of previous experimental work in the engineering field. The test results should be analyzed to display how conform to or differ from previous investigations or standard that may be employed for same measurements. In quantitative approach, the experiments are number-based whereas the qualitative approaches are text-based.

Statistical test are used for investigation in quantitative method and more in-depth information on case study of a qualitative method for research in engineering. The main aim in the use of quantitative approach provides observed effects that are interpreted by engineers of a test program on a problem or condition whereas the main function of qualitative approach is more subjective and that is, solving a problem or condition from the point of view of the past experience.

In conclusion, both quantitative and qualitative approaches are valid and reliable. However, the use of quantitative approach accounted largely for the

measurement device and engineering instrument employed. This offers heavier time expenditure on the planning and lighter on the analysis phase. The use of qualitative approach depended largely on the skill and rigor of an engineer, and that allows the engineer a lighter time expenditure on planning end but a heavier during the investigation stage.