

2. Fundamentals Of Research Methodology: A Guide For Researcher's

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Abstract:

The technique of analysis is a way to solve the problem systematically. It can be interpreted as a science to study the scientific conduct of scientists. In this section, we discuss the different steps a researcher normally takes to analyse his research problem along with its rationale.

It is not only research techniques, but methodology that must be known to the researcher. This research method architecture uses a variety of approaches. The aim of this chapter is to evaluate the research methodology by means of mixed kinds of research technologies. The analysis methodology also assists the researcher in seeking the results.

This paper explores basic research methods and provides a summary of various forms of reviews and guidance on how a literature review paper can be created and evaluated. It addresses common pitfalls and how basic research methods can be obtained.

Discuss qualitative and quantitative methods of data collection. The last segment demonstrates the general context for analysis. The purpose of this section is to demonstrate how the analysis has been carried out during the study periods.

Keywords:

Research, Methodology, Research Methodology, Research Techniques, Qualitative research, Quantitative Research, Researcher.

Introduction:

The building block of all academic study practices regardless of discipline is the analysis and relation to established knowledge. Accurately, thus, all academics should take precedence. The development of know-how in the field of corporate research accelerates at unprecedented pace, while becoming fragmented and interdisciplinary at the same time. This makes it difficult to stay up to date with cutting-edge science and to be at the forefront and to test collective proof in a specific research field.

Common-speech research refers to a language quest. Study may once again be described as a scientific and systematic search for relevant knowledge on a particular subject. Study is simply an art in scientific science. The Advanced Learner's Current English Dictionary describes research as "a diligent inquiry or enquiry explicitly in the quest for new evidence in some area of knowledge." [1] Redman and More defines study as" a systematic attempt to obtain new information. It involves a theoretical study of the set of methods and concepts linked to an information branch. The research methodology is generally the science to analyses how research is performed scientifically. It typically includes principles such as paradigms, theoretical model, stages, and quantitative or qualitative techniques. A method of addressing the issue of science by taking different steps logically. The approach helps not only to understand the scientific research products, but the process itself. The aim of the research methodology is to define and evaluate methods, to explain their weaknesses and resources, to explain their presuppositions and consequences and to link their potential to the crevasse zone in the "frontiers of knowledge"[4]. Their research methodological approach

Analysis approach is the path to be taken by researchers. It shows how these researchers formulate their problem and their goal and present their findings from

the study data. The research methods used in the research process were discussed in this chapter. It requires the study approach from the analysis technique to the distribution of findings. This chapter highlights research strategy, research design, research methodology, the area of study, data sources such as primary and secondary data source data, population considerations, the sample size determination of the questionnaires and the sample measurement of exposure to the workplace, data collection methods such as primary data c c Analysis methodologies used, such as the quantitative analysis and qualitative analysis of data, software for data analysis, reliability and validity analysis, reliability of information, reliability analysis, validity analysis, management of data quality, requirements for inclusion, consideration of ethics and distribution of findings and approaches to their use. A qualitative and quantitative approach for analysis is commonly understood to fulfil the objectives of the study. The study employed these mixed techniques, since all aspects of the data source were collected during the analysis. The goal of this approach is therefore to fulfil the research plan and the research objective established by the scientist.

Research Design:

A fitting structure for a study is provided by the research design. The choice to be taken in the research design process is very important because it determines how relevant information can be gathered for a study; however, there will be many interrelated decisions in the research design process.

Therefore, this study uses a descriptive research method for agreeing on the health, protection and patented harm effects in selected manufacturing industries from the workplace safety and health management framework. The descriptive research of Saunders et al. [6] or Miller [7] provides a detailed profile of individuals, incidents or circumstances. This definition gives researchers a profile of defined aspects of phenomena of interest from a viewpoint that is human,

corporate and industrial. This research design has therefore helped researchers to collect data from a broad range of interviewees regarding the effect on the manufacturing industry in Ethiopia of safety and health. And this has helped to analyses how it impacts workplace safety and health in the manufacturing industry. The research overall design and flow process are depicted in Figure 1.

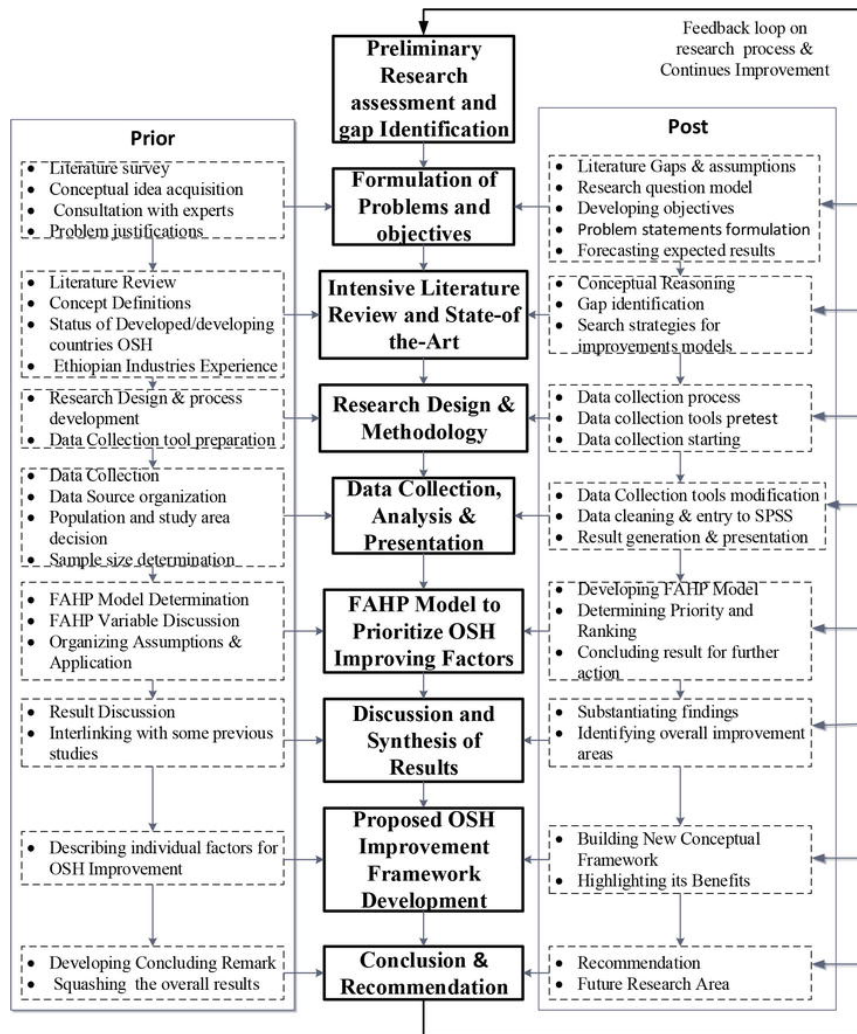


Figure 1. Research Methods And Processes (Author Design).

1. Fundamentals Of Research Methodology:

The research used qualitative and quantitative methods and a combination of primary and secondary sources to address the key research objectives. Quantitative analysis and results are supported by qualitative data. As the researcher used the qualitative and quantitative data types in data analyses, the

results obtained are triangle. This section discusses the field of study, data sources and sampling techniques.

1.1 The Study Area:

In accordance with studies carried out by Fraenkel and Warren [8], the population refers to the full range of persons (subjects or events), who are of common importance to the researcher. A random sampling system was used for the population determination of the trial. This data was collected from selected manufacturing industries in and around Addis Abeba from 07 March 2015 to 10 December 2016. The manufacturing companies were chosen on the basis of their number of workers, the year set and the prevailing possible accidents and the type of production industry, although all the criteria were difficult to meet.

1.2 Data Sources:

1.2.1 Primary Data Sources:

It has been obtained from the initial data source. The primary data were more reliable and trustworthy, with trusted analysis directly intact with the occurrence of the events. The main sources of data are industrial workplaces and industrial employees (managements and bottom workers) (interviews, questions and discussions) (by observation, photographs and pictures).

1.2.2 Secondary Data:

Data from several secondary sources have been obtained through a desk review. This includes reports and documentation of the projects in each manufacturing sector. Secondary sources of data were gathered from the OSH literature, and the majority of the data came from the business handbooks, reports and management records used in the Desktop Analysis. The industrial manufacturing sectors have been examined in terms of authoritative journals, books, numerous articles,

journals, proceedings, magazines, news lets, newspapers, websites and other media. The findings also were taken into consideration from existing documents, manuals, procedures, reports, statistics, laws, regulations and standards.

2. Data Collection Methods:

The following basic techniques were based on data collection methods. This included the collection of secondary and primary data focusing on quality and quantitative data as described in the previous section. Mechanisms for data collection are developed and designed according to suitable procedures.

2.1 Primary Data Collection Methods:

Qualitative and quantitative are the primary sources of results. Qualitative sources include field observations, interviews and informal conversations and survey questionnaires and interview questions for quantitative data sources. The following sections address how the data is derived from the key sources.

2.1.1 Workplace Site Observation Data Collection:

An, significant part of science is observation. Observations are closely related to the collection of data and are based on multiple sources: documents, archival records, interviews, direct observations and observations made by participants. Observatory study results are known to be very reliable since the researcher can obtain a thorough understanding of a certain behaviour.

The researchers used the method of observation as a tool for the collection of information and data both before and after the questionnaire was developed. More than 20 basic findings were made by the researcher in the fields of manufacturing. Through these observations, the working atmosphere and the various aspects of the production method and OSH practice became better understood.

2.1.2 Data Collection Through Interview:

Interview with people who consider themselves especially informed about the subject of concern is a loosely organized qualitative in-depth interview. The interview is usually conducted in a face-to - face atmosphere that enables the researcher to look for new ideas, to ask questions and to analyze phenomena from multiple perspectives. It helps the investigator to consider the causes and implications of the current working climate in detail. It has created opportunities to refine efforts in data collection and to analyses specialist structures or processes. It was used when the researcher was faced with written documents or paper limitations or needed to triangulate the data gathered in other primary and secondary sources.

In this study, qualitative methods and interviews are also carried out. The benefit that interviews can be used as a tool is that they can pose questions which the interviewee may not have expected. The related researchers carried out all interviews on a face-to - face basis at the workplace with staff, management and technical personnel. All interviews have been transcribed and documented.

2.1.3 Data Collection Through Questionnaires:

In practical research, questionnaires are the key method to obtain primary information, because the investigator can decide about the sample and the types of questions [6].

In this document, each respondent is asked to answer the same set of mixed questions to avoid partiality. The design of the questionnaire was initially coded and combined on the basis of standard structures from a specific subject. The questionnaire therefore produced valuable data that were important for the achievement of the dissertation targets.

The established questionnaires were based on a Likert five-point scale. A five-point Likert scale for which 1 is "strongly disagree" to 5 = "strongly agree" was used to answer every argument, and the answers were summarized to generate a score for the acts.

2.1.4 Data Obtained From Experts' Opinion:

The data was also collected from the opinion of the expert concerning the comparison of information, management, cooperation and the use of technology, including its sub-factors. For the priority making and decision-making of OSH, data collected in this way have been used to boost factor priority. In prioritizing the variables, Saaty scales (1–9) were used, then the values derived from previous research using triangular fuzzy set were converted to Fuzzy. [9].

2.1.5 Workplace Site Exposure Measurement:

The researcher has measured the workplace environment for dust, vibration, heat, pressure, light, and noise to know how much the level of each variable is. The primary data sources planned, and an actual coverage has been compared as shown in Table 1.

Instrument	Planned	Actual coverage	Success level
Interview/discussion	15	13	87%
Survey questionnaires	267	189	71%
Observation	20	18	90%
Workplace site exposure measurement	20	20	100%

Table 1. Planned Versus Actual Coverage Of The Survey.

The response rate was strong for the proposed source of data, and the pilot test showed that the questionnaires were accurate. A total of 87 per cent were respondents to interviews / discussions; the response rate for survey questionnaires achieved was 71 per cent, and for the entire data collection system,

the response rate for field observations was 90 per cent. Therefore, the quality standard of the data organization was not affected.

This rate of response is considered indicative of organizational studies. Since the survey accepts that the rate of response is 30%, it is regarded as acceptable [10]. Saunders et al. [6] submitted that the 20 percent reaction questionnaire is appropriate. The researchers should not be discouraged by low response rates, since a good deal of published research is also low in response. Therefore, in order to satisfy research objectives, the response rate in this study is reasonable and very strong.

2.1.6 Data Collection Tool Pretest:

The survey, interviews and resources were performed to verify whether or not the tool material was accurate within the context of the respondents. The validity of the content (in which the questions are answered without missing significant points), internally valid (in which the questions posed respond to investigator's findings), and externally valid (in which the findings would generalize the survey population) were therefore reflected. This pilot test was demonstrated before the basic collection of data was begun. A few minor changes to the initial data collection tools were made following a feedback process. The pilot test was conducted on 10 sample sizes randomly selected from the target sectors and experts.

2.2 Secondary Data Collection Methods:

The secondary information refers to data gathered by someone other than the user. This data source offers insight into the field of study of the modern process. It also creates a kind of research void that the researcher has to fill. These secondary sources of information may be internal and external knowledge sources covering a broad variety of fields.

Literature / Desk analysis and company documentation and studies: In order to achieve the aims of the dissertation, the researcher carried out extensive online and offline analyses of documents and reports from businesses. The literature reviews can be understood from a methodological point of view to include content analyses that incorporate quantitative and qualitative factors to determine both structural (descriptive) and continual parameters.

The search for literature was conducted using database sources such as MEDLINE, Emerald, Taylor's or Francis' journals, EMBASE, PsykINFO, Sociological Abstracts (Sociological Literature), Injury Checklists, U.S. Labor Statistics, European Safety and Health Databases, ABI Notify, Business Source First (Business/Management Literature); The search strategy focuses on papers or studies comparing one or more dimensions within the context of the study OSH model. This quest strategy was based on a strategy of the Health Measurement Instrument Selection (COSMIN) Community system and measurement philtre. Unrelated papers on the research model and priorities were omitted based on screening. In order to decide whether or not they needed to be included for further review, researcher (main investigator) reviewed a range of over 2000 journals, web pages, studies and recommendations prior to the screening. Before the analysis of the main group of over 300 papers began, gaps were thoroughly established and resolved. The remaining papers were carefully checked and the information on the instrument was extracted to determine the dimension of the research interest after removing papers based on the title, keywords and abstract. A comprehensive list of items was collected and checked to find any missing elements within each study aim or purpose.

3. Methods Of Data Analysis:

The method of data analyses follows the procedures described below. In the problem statement, the data-analysis portion addressed the fundamental issues.

Assessing, assessing, comparing and synthesizing the experience of developing and industrialized countries with OSH in manufacturing industries.

3.1 Quantitative data analysis:

The primary and secondary data mentioned above in this chapter were collected with quantitative data. This data analysis was based on Excel, SPSS 20.0, Office Word and other resources in their data form. This research focuses on the analyses of numerical / quantitative data.

Data coding and interpretation were done before interpretation. The data were encoded with SPSS 20.0 software as data obtained from questionnaires in order to analyze the data obtained easily. In this work, a numeric or character symbol was defined, categorized and assigned to data that has only been preceded in one way [11, 12]. All answers were pre-coded in this report. They have been taken from the answer list with a number that fit a certain set. This method has been extended to all prior problems that needed to be resolved. After the data were completed the following steps have been entered in a software package for statistical analysis: SPSS version 20.0 on Windows 10.

Data analysis provided descriptive statistics and graphical analysis for visualization of data. The study analyzed the relationship between variables and compared how they interact. This has been achieved by using the nonparametric statistical and cross tabulation / Chi Square, correlation and factor analysis.

3.2 Qualitative Data Analysis:

Qualitative data analysis and quantitative data analysis triangulation. In order to help conclusions, the interviews, observations and studies were used. The findings of the quantitative debate were integrated into the data analyses.

3.3 Data Analysis Software:

On Windows 10, the data were entered and analyzed using SPSS 20.0. The analyses assisted by SPSS software contributed greatly to the findings. The results of the SPSS had been checked and corrected by the data. In the research questionnaires the programmed evaluated and compared the outcomes of the various variables. The photos and analytical tools are also used for Excel.

4. The Reliability And Validity Analysis Of The Quantitative Data:

4.1 Reliability Of Data:

Measurement reliability determines the quantity without distortion (error-free) and thus allows for accurate time- and over-time measurements of the device [8]. The accuracy and consistency of the data were monitored in the reliability review. The researcher examined the accuracy and precision of the calculation process in the case of reliability review. Trustworthiness has many meanings and methods, but the term is consistent in many environments [10]. The calculation meets the reliability criteria when reliable results are obtained during the data analysis process. As shown in Table 2, the reliability is determined by the alpha of Cranach.

s/n	Qualitative data major groups	Items number	Alpha standardized)
1	Knowledge related factors	K01 to K08	0.864
2	Management related factors	M01 to M17	0.877
3	Technology and suppliers related factors	T01 to T10	0.792
4	Collaboration and support related factors	C01 to C07	0.781
5	Policy , standards and guidelines related factors	P01 to P08	0.888
6	Hazards and accidents related factors	H01 to H10	0.720
7	Personal Protective Equipment related factors	PPE01 to PPE10	0.931
	Total	70	0.966

Table 2. Internal Consistency And Reliability Test Of Questionnaires Items.

K stands for knowledge; M, management; T, technology; C, collaboration; P, policy, standards, and regulation; H, hazards and accident conditions; PPE, personal protective equipment.

4.2 Reliability Analysis:

The alpha of Cronbach is a measure of internal accuracy, i.e. the closeness of a group of objects [13]. It is a measure of reliability in scale. The trustworthiness of internal consistency is often calculated by the alpha value of Cronbach. In most research cases, a 0.70 or higher reliability coefficient is considered "acceptable" [14]. The reliability analysis was similar after eliminating 13 items for the internal accuracy of measurement on the Likert scale; 76 items had 0.964 reliability coefficients and the individual groupings shown in Table 2. The Cronbach alpha test was also found to be internally consistent. Table 2 shows the internal accuracy of the seven main instruments, in which their reliability for this research falls within the appropriate range.

4.3 Validity:

Face validity as described by Babbie [15] is an indicator that makes certain variables seem a fair measure and the instrument measures, according to its subjective judgement, in terms of relevance [16]. [16]. In this analysis, the researcher thus ensured that ambiguity was removed with appropriate terms and concepts in order to improve clarification and general appropriateness [16] during the production of the instruments. In order to make the measuring instruments accurate and decide whether the instruments should be deemed to be accurate at face value, the researcher submitted to the research oversight and the joint supervisor, who are both occupational health experts.

This study directed the researcher to create the instruments by reviewing literature on compliance with the conditions of occupational health and safety and by

methods of data collection. Furthermore, the preliminary work performed before the main analysis helped the researcher avoid discrepancies about the quality of the instrument data set. A detailed review of the instruments by the statistical expert and the supervisor and common experts ensures that the instruments are enriched to ensure that all the concepts involved in the analysis are used.

Criteria of Good Research:

Whatever may be the types of research works and studies, one thing that is important is that they all meet on the common ground of scientific method employed by them. One expects scientific research to satisfy the following criteria:

1. The purpose of the research should be clearly defined, and common concepts be used.
2. The research procedure used should be described in sufficient detail to permit another researcher to repeat the research for further advancement, keeping the continuity of what has already been attained.
3. The procedural design of the research should be carefully planned to yield results that are as objective as possible.
4. The researcher should report with complete frankness, flaws in procedural design and estimate their effects upon the findings.
5. The analysis of data should be sufficiently adequate to reveal its significance and the methods of analysis used should be appropriate. The validity and reliability of the data should be checked carefully.
6. Conclusions should be confined to those justified by the data of the research and limited to those for which the data provide an adequate basis.
7. Greater confidence in research is warranted if the researcher is experienced, has a good reputation in research and is a person of integrity.[17]

Conclusion:

The methodology and nature of research have suggested the overall research flow for the study. Data sources and methods of data processing have been used. This research method, from problematic formulation to problem validation using all parameters, indicates the overall research strategies and frameworks. It has laid some foundations and planned and developed research methods for scientists. This allows researchers to take the data obtained and analyzed from the start of the problem statement to the finding of analysis as one of the samples and models. This research flow particularly supports new researchers in the field of science and methodology.

References:

1. The Advanced Learner's Dictionary of Current English, Oxford, 1952.
2. L.V. Redman and A.V.H. Mory, The Romance of Research, 1923.
3. Irny, S.I. and Rose, A.A. (2005) "Designing a Strategic Information Systems Planning Methodology for Malaysian Institutes of Higher Learning (isp-ipta), Issues in Information System, Volume VI, No. 1, 2005.
4. https://www.researchgate.net/publication/39168208_Research_Methodology_Part_1_Introduction_to_Research_Research_Methodology.
5. Patel M, Patel N. Exploring research methodology: review article. International Journal of Research and Review. 2019; 6(3):48-55.
6. Saunders M, Lewis P, Thornhill A. Research Methods for Business Student. 5th ed. Edinburgh Gate: Pearson Education Limited; 2009
7. Miller P. Motivation in the Workplace. Work and Organizational Psychology. Oxford: Blackwell Publishers; 1991
8. Fraenkel FJ, Warren NE. How to Design and Evaluate Research in Education. 4th ed. New York: McGraw-Hill; 2002

9. Saaty TL. The Analytical Hierarchy Process. Pittsburg: PWS Publications; 1990
10. Sekaran U, Bougie R. Research Methods for Business: A Skill Building Approach. 5th ed. New Delhi: John Wiley & Sons, Ltd; 2010. pp. 1-468
11. Luck DJ, Rubin RS. Marketing Research. 7th ed. New Jersey: Prentice-Hall International; 1987
12. Wong TC. Marketing Research. Oxford, UK: Butterworth-Heinemann; 1999
13. Cronbach LJ. Coefficient alpha and the internal structure of tests. *Psychometrika*. 1951; 16:297-334
14. Tavakol M, Dennick R. Making sense of Cronbach's alpha. *International Journal of Medical Education*. 2011; 2:53-55. DOI: 10.5116/ijme.4dfb.8dfd
15. Babbie E. The Practice of Social Research. 12th ed. Belmont, CA: Wadsworth; 2010
16. Polit DF, Beck CT. Generating and Assessing Evidence for Nursing Practice. 8th ed. Williams and Wilkins: Lippincott; 2008
17. C.R. Kothari, Research Methodology Methods and Techniques, ISBN (13): 978-81-224-2488-1, 2004.