A Literature Survey: Data Gathering Instrument and Method Selection Framework

Lorence Dhlakama & Stanley Murairwa

Africa University Box 1320, Mutare, Zimbabwe

ABSTRACT

While there are several data gathering instruments and methods in the literature, the choice of which combination to use in the digital period is highly complex. The quality of the data gathered determines the reliability and acceptability levels of the research results and recommendations. The research examined the available data gathering instruments and methods to assess their adequacy to meet the requirements of the researchers in the current digital, pandemic, and epidemic period. The study applied a cross-sectional literature survey and gathered primary and secondary qualitative and quantitative data for analysis. The study found that most researchers preferred the questionnaire as a data gathering instrument. The research also found that surveys, observation, interviews, focus group discussions, and document and record analysis are the most preferred data gathering methods. The study noted that several digital platforms have been developed to gather data online. However, there is a demand for more instruments and methods for gathering research data in the current digital period. The research proposed a matrix for selecting the appropriate combination of data gathering methods and instruments for the studies. The research suggested a framework for selecting appropriate data gathering methods and instruments for different studies. The researchers can use the framework to guide them in choosing the instruments and methods for gathering the research data.

Keywords: Data Gathering Instruments, Questionnaires, Interviews, Data Gathering Methods, Focus Group Discussions, Surveys

JEL: C, C8, C80

INTRODUCTION

The researchers want to gather accurate data constantly for their studies. The type of study determines the data collecting instruments and methods the researcher could use. The data gathering instruments are devices and tools used to gather or record the research data. The choice of data gathering instruments to use depends on the appropriate data gathering methods for the study. The data gathering methods include questioning, measuring, observing, reviewing documents, and the hybrid combination of these methods. The worldwide revolutionisation of higher and tertiary education demands that researchers conduct studies and gather adequate and accurate data. The researchers can gather qualitative, quantitative, or both data for the study. The researcher is guided by the type of research, qualitative, quantitative, or mixed methods, data gathering methods, and data source to select the appropriate data gathering instrument. The common data gathering templates are customer satisfaction, demographics, feedback forms, and online questionnaires (Formplus, 2023). Zimbabwe introduced Education 5.0 (Murairwa, 2023) to ensure that higher and tertiary education institutions focus on five distinctive pillars: teaching, outreach activities, research, creativity and innovation, and industrialisation. To achieve the objectives of these five pillars, the researchers must collect accurate, reliable, and adequate data for analysis.

In a research process, selecting the appropriate data gathering instrument is an essential step because it determines the quality of the findings (Bastos, Duquia, González-Chica, Mesa, & Bonamigo, 2014). Thus, the need for validity and reliability tests of the data gathering instruments and methods is required for all studies. According to Bastos, Duquia, González-Chica, Mesa, and Bonamigo (2014), the validity and reliability of the acceptable level of data collecting instruments and methods are at least 0.5. According to Kritika (2024) and

Proofed (2023), selecting and justifying the research methods is a critical stage that directly influences the study's credibility and findings. The successful alignment of the data gathering instruments and methods to the objectives and questions will consequently lead to the collection of adequate information for analysis. Thus, well-justified data gathering instruments and methods are a cornerstone of robust research. Many studies have failed to provide a clear rationale or justification for selecting a particular data collecting instrument and method. This could be due to limited discussions of the available data collection instruments and methods. Therefore, there is a need for a framework to guide researchers in selecting the appropriate data gathering instruments and methods for their studies.

Moreover, the emergence of Artificial Intelligence (AI), the evolution of technologies, and the outbreak of epidemics and pandemics such as COVID-19 (Murairwa, 2021) complicated and ushered in new data gathering instruments and methods of the research processes. Young researchers face challenges in selecting the appropriate data gathering instruments (Jain, 2021) and data gathering methods, especially in the current digital, epidemic, and pandemic period. Choosing appropriate data gathering instruments and methods is an important step in research design, yet it remains a complex and time-consuming task for most researchers. The absence of a comprehensive framework for selecting data gathering instruments and methods hinders the research studies' reliability, efficiency, and validity. By providing a systematic and structured approach to choosing data collection instruments and methods, this research seeks to enhance the quality and reliability of research findings, ultimately contributing to advancing knowledge in various disciplines. The COVID-19 experience transitioned research methodologies to the digital period. Thus, the questions that are answered by this research are "Do researchers have adequate data gathering instruments in the digital, epidemic and pandemic period?", "Do young researchers understand the differences between data gathering instruments and methods?" and "How do researchers choose the data collecting instruments and methods?" Therefore, the objectives were to examine the available data gathering methods and instruments and develop a framework to guide researchers in selecting the most suitable approaches for their research questions and objectives in the current digital, epidemic, and pandemic research period.

LITERATURE REVIEW

Murairwa (2019; 2010) developed and applied the Data Recording Table (DRT) to collect experimental results. The researchers can adopt or adapt the DRT to gather primary or secondary data. The DRT can be used as a digital or hard copy instrument during data gathering. The questionnaire, data recording table, checklist, picture chart, pen and paper, and electronic devices are data gathering instruments (Murairwa, 2019; 2010). A data gathering tool is an instrument that is used to record data…. (Murairwa, 2019b, p. 97). Regarding the data gathering methods, Murairwa (2019b; 2016) discussed surveys, focused group discussions, observation, interviews, experiments, postal, and telephone methods.

The outbreak of COVID-19 resulted in restricted movements of researchers. However, the studies continued during the lockdown period with new instruments and methods of conducting research. Even, COVID-19 was supposed to be researched and data collected for analysis. The data gathering instruments are the survey questionnaire and pen (Al Masud, 2024). Some researchers such as Abawi (2014), Liza (2024), Haruna (2023), Specta (2023), Jain (2021), and Mosweu and Mosweu (2020) refer to data gathering methods and instruments as the same by referring to interviews and observation as data gathering instruments instead of referring to them as data gathering methods. In the observation method, the data gathering instrument can be the researcher (Wa-Mbaleka, 2020). According to Islam (2024), the data collection strategies used with data gathering tools are case studies, checklists, documents and records, focus groups, interviews, observations, oral histories, questionnaires, and surveys. The discussions reveal a challenge in distinguishing between data gathering instruments and methods. Table 1 shows the reviewed studies on data gathering instruments.

Table 1: Data Gathering Instruments

Data gathering Instrument	Source
Questionnaire	Bhat (2024); Islam (2024); Haruna (2023); Simplilearn, (2023) ; Formplus (2023); HeroVired (2023); Jain (2021); Taherdoost

	(2021); Anjum (2020); Goyal (2020); Johnson (2020); Mosweu & Mosweu (2020); Mkandawire (2019); Chapel & Wang (2019); Murairwa (2019b; 2016); Simister (2017); Canals (2017); Abawi (2014);
Pen and Paper	Al Masud (2024), Formplus (2023); Murairwa (2019b; 2016)
Memos and Field Notes	Jain (2021); Taherdoost (2021)
Digital Recorder	Murairwa (2019b; 2016); Simister (2017)
Picture Capturing Device	Murairwa (2019b; 2016); Simister (2017)
Researcher	HeroVired (2023); Wa-Mbaleka (2020)
Data Recording Table	Murairwa (2019; 2010)
Computer	Simplilearn, (2023)
Checklist	Islam (2024); Murairwa (2019b; 2016)
Web-Based	Simplilearn, (2023); Anjum (2020); Laitenberger & Dreyer (1998)
Mobile Data Gathering Applications	Simplilearn, (2023); HeroVired (2023); Tomlinson, et al. (2009)
Case studies	Islam (2024); Taherdoost (2021); Simister (2017)
Database	Liza (2024); Simplilearn (2023); Taherdoost (2021)

Jain (2021) compared survey and face-to-face interviews in a qualitative exploratory study. The researcher recommended using interviews instead of surveys as a data gathering instrument in qualitative exploratory research. The researcher considered interviews and surveys as data collection instruments. In agreement, Dobility (2024) stated that surveys may also be called forms. The research methods are the tools used to collect data (Dawson, 2019). Laitenberger and Dreyer (1998) evaluated the newly developed web-based inspection data gathering instrument and found it most preferred by researchers because of its reliability. Mobile phones were discovered to be better data gathering instruments than personal digital assistants (Tomlinson, et al., 2009). What is clear about the data gathering instrument is that it combines an electronic data gathering tool and a handheld digital device. Abawi (2014) discussed the steps of designing a questionnaire: defining the research objectives; defining the target population and methods of contact; designing the questionnaire; pilot testing (if necessary); questionnaire administration; and interpretation of the results. A questionnaire allows the researcher to gather adequate subjective and objective data that can be analysed to respond to the problem of the study (Abawi, 2014). The researcher also discussed the focus group discussion and interview data gathering methods. Malik (2024) discussed three research methodologies in the communication field and their examples: qualitative (interviews, focus group discussions, and observation), quantitative (experiments, surveys, content analysis, and meta-analysis), and rhetorical (textual analysis). Abawi (2014) referred to observation, document review, questioning, measuring, or a combination of these methods as data gathering methods. Bhat (2024) referred to data gathering methods as techniques or procedures for gathering data. Each method has merits and demerits that make it suitable for specific research data collection methods.

Bhat (2024) discussed the available survey software that could be customised to suit the data collection method for one's study. This is a good development as it points to the availability of online (software & Apps) survey data gathering instruments. Bhat (2024) and Taherdoost (2021) examined the sources and types of data which are critical aspects to consider when selecting the instruments and methods for gathering data. There are most

common and less common data gathering methods (Taherdoost, 2021). The statement indicates that researchers have different preferences regarding the available data gathering methods. According to Simplilearn (2023), the methods for gathering primary data are surveys, questionnaires, case studies, interviews, observations, experiments, and focus group discussions. Furthermore, the methods for collecting secondary data are published sources, online databases, government and institutional records, publicly available data, and past research studies. However, most studies did not differentiate between the methods and instruments of gathering data. Table 2 presents the literature accessed data gathering methods.

Table 2: Data Gathering Methods and Sources

Gathering Methods	Sources
Surveys	Bhat (2024) ; Islam (2024); Liza (2024); Malik (2024); Formplus (2023); Simplilearn, (2023); HeroVired (2023); Taherdoost (2021); Jain (2021); Anjum (2020); Goyal (2020); Murairwa (2019b; 2016) Simister (2017); Canals (2017)
Observation	Bhat (2024); Islam (2024); Liza (2024); Malik (2024); Haruna (2023); Simplilearn, (2023); HeroVired (2023); Taherdoost (2021); Anjum (2020); Johnson (2020); Mosweu & Mosweu (2020); Abawi (2014); Murairwa (2019b; 2016); Simister (2017);
Interviews	Bhat (2024); Islam (2024); Liza (2024); Malik (2024); Haruna (2023); Simplilearn, (2023); HeroVired (2023); Anjum (2020); Goyal (2020); Johnson (2020); Mosweu & Mosweu (2020); Murairwa (2019b; 2016); Taherdoost (2021); Jain (2021); Canals (2017); Abawi (2014); Kairuz, Crump, and O'Brien (2007)
Experiments	Bhat (2024); Malik (2024); Simplilearn, (2023); Haruna (2023); Taherdoost (2021); Murairwa (2019b; 2016)
Telephone	Simplilearn, (2023); Taherdoost (2021); Goyal (2020)
Postal	Taherdoost (2021); Goyal (2020); Murairwa (2019b; 2016);
Internet Site	Simplilearn, (2023); Goyal (2020); Murairwa (2019b; 2016);
Focus-Group Discussions	Bhat (2024); Islam (2024); Liza (2024); Malik (2024); Simplilearn, (2023); HeroVired (2023); Taherdoost (2021); Anjum (2020); Goyal (2020); Johnson (2020); Murairwa (2019b; 2016); Simister (2017); Canals (2017); Kairuz, Crump, and O'Brien (2007); Abawi (2014)
Direct Measurement	Haruna (2023); Simister (2017)
Documents and Records Analysis	Islam (2024); Malik (2024); Haruna (2023); Jovancic (2023); HeroVired (2023); Simplilearn (2023); Jain (2021); Anjum (2020); Johnson (2020); Mosweu & Mosweu (2020); Abawi (2014)
Quizzes/Tests	Jovancic (2023); HeroVired (2023); Johnson (2020)
Polls	Bhat (2024); HeroVired (2023)
Delphi	Bhat (2024); HeroVired (2023)
Debates	HeroVired (2023); Canals (2017)
Narratives	HeroVired (2023); Canals (2017)

Data gathering instruments are tools that researchers use to collect data in the research process (Mosweu & Mosweu, 2020). The researchers listed interviews, questionnaires, documentary analysis, and observation as data gathering instruments. Thus, the list of data gathering instruments by Mosweu and Mosweu (2020) includes tools and procedures. The data gathering instruments are tools and materials used to gather data (Haruna, 2023). These data gathering instruments also known as data-measuring instruments include observation, experiments, scales, interviews, questionnaires, and archival documents (Haruna, 2023). Haruna's (2023) list of instruments combines instruments and methods of gathering data. Formplus (2023), Goyal (2020) and Mosweu and Mosweu (2020) defined data gathering tools as devices or instruments used to gather data. Some researchers avoided classifying interviews, and focus group discussions but questionnaires as data gathering instruments. Therefore, the question is "What is a data gathering instrument?"

Simister (2017) examined the focus group discussions, direct measurement, observation, surveys, questionnaires, photography, video, and case studies as data gathering methods and tools. The researcher left it for other researchers to distinguish between the methods and instruments for gathering data. Liza (2024) assessed focus group discussions, observation, surveys, and interviews as data gathering tools. The data gathering tools are surveys, applications, and software (Liza, 2024). Thus Liza (2024), used the term "tool" to refer to both methods and instruments for gathering data. This poses a challenge to young researchers who may find it difficult to differentiate between data gathering methods and instruments. Among interviews, surveys, focus groups, and questionnaires, HeroVired (2023) also assessed the time series analysis, smoothing techniques, barometric method, polls, and Delphi as techniques for gathering data. However, HeroVired (2023) examined surveys, sentence completion, role-playing, word association, and observation as data gathering tools. Kairuz, Crump, and O'Brien (2007) described some basic tools to undertake in-depth interviews and focus group discussions. Jain (2021) examined surveys, interviews, memos, and field notes as data gathering tools. The most preferred data collection methods are interviews, existing data, questionnaires and surveys, observations, focus groups, and online data collection (Anjum, 2020). Thus, the prominent questions are "What are the research data gathering methods?" and "What are the differences between methods and instruments of gathering research data?"

RESEARCH METHODOLOGY

Type of research: A literature survey was conducted on scholarly studies that examined different data gathering instruments and methods. The desk research gathered secondary qualitative and quantitative data for analysis.

Variables of the research: The research gathered the researchers' preferences on the data gathering instruments and methods from 35 relevant studies from the literature. The research collected data on the types of data gathering instruments and methods.

Population, Sample, and Sampling: The research reviewed 65 articles from the literature and analysed data from 35 relevant articles for the study. The research examined 54% of the total articles accessed from the literature.

Data Gathering method: The data gathering method is a technique or procedure for collecting primary or secondary data for research purposes. The research used document analysis to gather data for the study. The document analysis allows the researcher to select appropriate data for the study.

Data Gathering Instrument: A data gathering instrument is a tool or device used to collect data for research purposes. A Data Recording Table (Murairwa, 2019; 2010) was designed and implemented to gather data from the literature for the study. The Data Recording Table is simple and easy to implement during data gathering.

Data Analysis Tools and Procedures: The research used descriptive and inferential statistics to analyse data gathered for the study. The difference of two proportions test was implemented to test at a 5% level of

significance the hypothesis that H_0: Two proportions are the same versus H_1: Two proportions are not the same. The Z-test value was computed with

$$Z = \frac{(p_1 - p_2) - (\pi_1 - \pi_2)}{\sqrt{\hat{p}(1 - \hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}, \qquad (1)$$

where $p_1 = \frac{x_1}{n_1}$, $p_2 = \frac{x_2}{n_2}$, $\hat{p} = \frac{x_1 + x_2}{n_1 + n_2}$ is the pooled proportion, $p_1 + q_1 = 1$, $p_2 + q_2 = 1$, p_1 is the first sample proportion, p_2 is the second sample proportion, π_1 is the first population proportion, π_2 is the second population proportion, n_1 is the size of the first sample and n_2 is the size of the second sample. The p-value was computed with

$$p - value = 2 \times Min(p, 1 - p), \qquad (2)$$

The larger the p-value the more it supports H_0. If $\alpha > p - value$, H_0 is rejected, otherwise it is not rejected. The research applied the Effect Size to test the significance of the magnitude of the difference between the two proportions. The Effect Size (h) was computed with

RESULTS AND DISCUSSIONS

The results show that the primary data sources are associated with surveys, focus groups, observation, interviews, simulation, and experiment methods. The secondary data sources include libraries, government and non-government agencies, the internet, archived documents, commercial information, and education institutions. The results show that most researchers use the term tools to refer to methods and instruments for gathering research data. A clear distinction between data gathering methods and instruments could benefit young scholars and researchers. The Oxford Dictionary defines,

"a tool as a device or implement, especially one held in hand, used to carry out a particular function", and " a method as a particular procedure for accomplishing or approaching something, especially a systematic or established one".

The Oxford Dictionary definitions show that a data gathering instrument differs from a data collecting method because a device and a procedure differ. The results confirm the discussions in Bhat (2024) and Taherdoost (2021). A data gathering instrument is a device (tool) (Mosweu & Mosweu, 2020) while a data gathering method is a particular procedure (Bhat, 2024). Thus, this study defines a data gathering instrument as a device (tool) to collect, measure, and record research data from a source. Moreover, the study delineates a data gathering method as a technique (procedure) used to collect data from a source. The clarification should assist researchers in selecting and presenting their data gathering instruments and methods in the methodology chapter without confusion. The literature survey results show that the common data gathering methods are

"Interviews, Focus Group Discussions, Surveys, Observation, Document and Record Analysis, social media analytics, Experiments, Postal, Internet Site, Telephone, Quizzes/Tests, Measurements, sensor-based, Mobile, Polls, online experiments, Delphi, Debates, Narratives, Crowdsourcing, Phenomenology, Grounded Theory, Discourse Analysis, Secondary Data Analysis, Ethnography, Case Studies, Content Analysis, and Hybrid Methods".

The literature survey identified several data gathering methods that the researchers could use for their studies. The results support the findings in UpMetrics (2022). The researcher should consider the objectives, questions, population, resources, and information quality in selecting a data gathering method. The researcher should examine the pros and cons of each data gathering method before deciding on one to use. The results from the literature survey show several commonly used qualitative and quantitative data gathering instruments and these include

"Case Studies, Social Media Analytic Tools, Web Scraping tools, Checklists, Computers, Data Recording Tables, Databases, Memos and Field Notes, Mobile Applications, Pens and Papers, Picture Capturing Devices, Questionnaires, Researchers, Sensors, Wearable Devices, Audio and Video Recorders, Qualtrics, Tableau, SPSS, NVivo, Atlas.ti, Internet-Based, Diaries and Logs, Case Study Protocols, Content Analysis Templates, Delphi Technique Questionnaires, Grounded Theory Coding Sheets, Interview Guides, Focus Group discussion Guides, Google forms, SurveyMonkey, Typeform, and Hybrid Instruments".

Bhat (2024) and Taherdoost (2021) distinguished between data gathering instruments and methods. The research objectives, questions, population, reliability, and available resources are considered for selecting the data gathering instruments for the current studies. It is important to ensure that the data gathering instrument selected is valid, reliable, and appropriate for the research goals. Specta (2023) stated that the most preferred data gathering instruments and methods are

".......Questionnaires (widely used in both qualitative and quantitative research), Interviews (suitable for qualitative research), and Observation (suitable for both qualitative and quantitative research".

The results agree with the findings of Taherdoost (2021), Johnson (2020), and Murairwa (2019b; 2016). The researcher requires skills and knowledge to design a questionnaire with appropriate questions that collect adequate data to respond to the research objectives. However, the social desirability bias and respondents' misunderstanding may be addressed by cognitive interviewing, reverse coding, neutral wording, visual aids, randomised response technique, validation, clear and concise language, anonymity, pre-testing, and using open-ended questions. The strategies to reduce the impact of non-response bias and sample representativeness in a survey are increasing response rates (incentives, clear communication, convenience, follow-up reminders, and personalisation), reducing dropout rates (engaging content, mobile optimisation, progress indicators, breaking surveys into sections, and non-response analysis), improving sample representativeness (probability sampling, weighting, post-stratification, response propensity scoring, and data augmentation), and analysing non-response (non-response analysis, response rate analysis, and bias analysis).

The results in Islam (2024) and Specta (2023) did not distinguish between data gathering instruments and methods but recognised the existence of the two groups. The literature survey results indicate the demand for mixed methods research which favours hybrid methods and instruments for gathering both qualitative and quantitative data. The study proposed a matrix for selecting the appropriate combination of the common data gathering instruments and methods in Table 3.

Table 3: Common Data Gathering Instruments and Methods Selection Matrix

Data Gathering Instruments	Data Gathering Methods/Procedures												Innovative
	Surveys	Observation	Interviews	Experiments	Telephone	Postal	Internet Site	Focus-groups	Polls	Delphi	Quizzes/Tests	Document Review	
Audio & Video Recorders	■	■	■	■	■			■		■		■	
Case Studies	■	■	■	■				■				■	
Checklist	■	■	■	■	■			■			■	■	
Computers	■	■	■	■	■	■	■	■	■	■	■	■	
Content Analysis Templates	■	■	■	■								■	

The following rows constitute the matrix table (Table 3), whose shaded cells indicate applicable combinations:

- Data Recording Tables
- Databases
- Diaries & Logs
- Group Discussion Guides
- Internet-Based Tools
- Memos & Field Notes
- Pens & Papers
- Picture Capturing Devices
- Questionnaires
- Researchers
- Social Media analysis tools
- Software & Apps
- Survey Tools

Table 3 presents a matrix for selecting the appropriate combination of the data gathering instruments (tools) and data gathering methods (procedures). For instance, Table 3 shows that the questionnaire can be used as a data gathering instrument for surveys, interviews, telephone, postal, focus group discussions, polls, quizzes/tests, and innovative data gathering methods. Thus, a survey method can use a questionnaire as a data gathering instrument (tool). The results support the findings in Al Masud (2024), Simplilearn (2023), Formplus (2023), Jain (2021), Mkandawire (2019), Chapel and Wang (2019), Taherdoost (2021), Simister (2017), and Abawi (2014). The researchers used the questionnaires with the listed data gathering methods except for the internet site, Delphi, and document review.

Table 3 also distinguishes between data gathering instruments and methods, an important aspect in writing the research methodology and determining the quality and reliability of the results. Table 3 is being converted into an electronic database for easy access by researchers during the writing of the study methodology. The research examined the researchers' preferences for the data gathering instruments and presented the results in Table 4.

Table 4: Preference Distribution of the Data Gathering Instruments

Data Gathering instrument	% Score	Rank
Questionnaire	37.25	1
Pen and Paper	7.84	2
Digital Recorder	5.88	3
Picture Capturing Device	5.88	3
Mobile Applications	5.88	3

Database	5.88	3
Checklist	5.88	3
Web-Based	5.88	3
Case studies	5.88	3
Memos and Field Notes	3.92	10
Researcher	3.92	10
Data Recording Table	3.92	10
Computer	1.96	13

The key findings in Table 4 show that a questionnaire (37.25%) is the most preferred research data gathering instrument. The reasons are that a hard or soft questionnaire is simple, efficient, and versatile and can gather adequate structured and standardised, reliable, subjective, and objective primary quantitative and qualitative data from a large geographically dispersed target population in a consistent way. Some of the online tools that researchers can use are Response Optimization (SurveySparrow, AskNicely, and Feedbackly), Survey Creation and Distribution (SurveyMonkey, Google Forms, and Typeform), Data Analysis and Visualization (Tableau, Power BI, and SPSS), Interactive Polling and Feedback (Mentimeter, Poll Everywhere, and Slido), and Online Communities and Panels (Userlytics, Swagbucks, and Amazon Mechanical Turk).

The results confirm the findings by Specta (2023), Taherdoost (2021), Anjum (2020), Johnson (2020) and Murairwa (2019b; 2016). The researchers' preferences for the rest of the data-gathering instruments in Table 3 are statistically the same as supported by the Z-test results between the Pen and Paper (7.84%) and Computer (1.96%) which are $Z = 1.1395$ and p is 0.25428. The result of the different proportions is insignificant at $\alpha < 0.05$. Since $p = 0.25428 > \alpha = 0.05$, H_0 is not rejected signifying that the two proportions are statistically the same. The results confirm that the preferences for the other twelve data gathering instruments are statistically the same. The research examined the researchers' preferences for the data gathering methods and presented the results in Table 5.

Table 5: Researchers' Preference Distribution of the Data Gathering Methods

Data Gathering Methods	% Score	Rank
Interviews	16.98	1
Focus-Group Discussions	15.09	2
Surveys	14.15	3
Observation	14.15	3
Documents & Records Analysis	10.38	5
Experiments	6.60	6
Postal	3.77	7
Internet Site	3.77	7

Telephone	2.83	9
Quizzes/Tests	2.83	9
Measurements	1.89	11
Polls	1.89	11
Delphi	1.89	11
Debates	1.89	11
Narratives	1.89	11

The key findings in Table 5 show that the most preferred data gathering methods are Interviews (16.98%), Focus Group Discussion (15.09%), Surveys (14.15%), Observation (14.15%), Documents and Records Analysis (10.38%), and Experiments (6.60%). The results confirm the findings of Taherdoost (2021), Johnson (2020), and Murairwa (2019b; 2016). Taherdoost (2021) stated that there are the most and least common data gathering methods. This confirms that the researchers' preferences on the available data gathering methods differ according to the study's objectives to be addressed. The Z-test results between Interviews (16.98%) and Documents and Records Analysis (10.38%) are $Z = 0.8035$ and $p = 0.42372$. The result indicates that the difference between the two proportions is insignificant at $p < 0.05$. Since $p = 0.42372 > \alpha = 0.05$, H_0 is not rejected implying that the two proportions are statistically the same. This, therefore, means that the first five data gathering methods have the same preference levels by the researchers.

The last nine data gathering methods are statistically the same as supported by the Z-test results between Experiments (6.60%) and Narratives (1.89%) which are $Z = 0.9773$ and $p = 0.32708$. The difference between the two proportions is insignificant at $p < 0.05$. Since $p = 0.32708 > \alpha = 0.05$, H_0 is not rejected. This means that the percentage scores are the same. The research proposed a process for selecting the data gathering methods and instruments and presented the results in Figure 1.

Qualitative/ Induction		• Interviews • Observation • Focus Group • Content Analysis • Ethnography • Case studies	• Picture devices • Digital Recorder • Memos & Notes • Researcher • Sheet • Schedule
Essential Elements		• Innovative Methods • Other Methods	• Online/Offline • Other Instruments
	Scope Resources Data Sources Language & Skills Artificial Intelligence & Machine Learning Information & Communication Technology		

Innovative Methods: Social Media Analytics, Sensor-Based, Mobile, Online Experiments & Crowdsourcing

Other Methods: Delphi, Grounded, Phenomenology, And Discourse Analysis.

Other Instruments: Diaries & Logs, Case Study Protocols, Content Analysis Templates, Delphi Technique Questionnaires & Grounded Theory Coding Sheets.

Figure 1: Data Gathering Instruments and Methods Selection (DCIMS) Framework

The DCIMS framework in Figure 1 shows the essential elements that should guide the researcher in selecting the method, design, data gathering method and instrument, and data analysis tools for the study. The important elements include the research problem, objectives and questions, theory, conceptual framework, technologies, skills, and available resources. For instance, if the data gathering method is an interview, the appropriate data gathering instrument is an automated interview schedule while the analysis tool is NVivo. Figure 1 shows the data gathering methods and instruments that should be used in quantitative, qualitative, and mixed methods studies. The researcher can design closed and open-ended questionnaires and surveys. The questionnaires and surveys can gather quantitative and qualitative data for the mixed-methods study. The DCIMS framework also reveals gaps in the application of mixed-methods approaches and the need for increased adoption of innovative data collection instruments and methods, such as social media analytics and sensor-based data collection. So a researcher with the research problem, theory, conceptual framework, and objectives should be able to select the appropriate method/design, and data gathering instruments, methods, and analysis tools for the study. The choice of data gathering methods and instruments to adopt/adapt, and implement depends on the objectives, type of research, source, and nature of the data, hypothesis, and available resources. There is a need to develop more data gathering instruments and methods in line with the changing technologies and complexity of real-life problems.

CONCLUSION AND RECOMMENDATIONS

The results show that the common data gathering methods are interviews, focus group discussions, surveys, observation, document and record analysis, experiments, postal, internet site, telephone, quizzes/tests, measurements, polls, Delphi, debates, and narratives. However, interviews, focus group discussions, surveys, and observation are the most preferred qualitative and quantitative data gathering methods. The findings show that the common data gathering instruments are case studies, checklists, computers, data recording tables, databases, digital recorders, memos and field notes, mobile applications, pen and paper, picture capturing devices, questionnaires, researchers, and internet-based. However, the most preferred data gathering instrument is a questionnaire because it collects data consistently from a large dispersed population. The research suggested a matrix for selecting an appropriate combination of the data collecting methods and instruments for different studies. The study developed a Data Gathering Instruments and Methods Selection (DCIMS) framework which researchers can use to select data gathering instruments and methods and data analysis tools for their studies. The DCIMS framework improves the quality and reliability of the data gathered and the research findings. The DCIMS framework could be used to select appropriate instruments and methods of collecting data and analysis tools for their studies. The study which covers most components of a standard research methodology, also attempts to distinguish between the data gathering instruments and methods for the benefit of young scholars. The research noted the need for new data gathering instruments and methods in the digital period, for instance, digital voice-controlled questionnaires and surveys.

ACKNOWLEDGEMENT

Areas for Further Research

The researchers should develop new data gathering instruments and methods that support studies in the changing technologies and complexity of the problems such as digital voice-controlled questionnaires and surveys.

REFERENCES

1. Abawi, K. (2014). Data Collection Instruments (Questionnaire & Interview). Training in Sexual and Reproductive Health Research Geneva 2014 (pp. 1-18). Geneva: Geneva Foundation for Medical Education and Research. Retrieved February 6, 2024, from https://www.gfmer.ch/SRH-Course-2013/Geneva-Workshop/pdf/Data-collection-instruments-Abawi-2014.pdf
2. Al Masud, A. (2024). Paper-and-Pencil Interviewing (PAPI). Retrieved from QuestionPro: https://www.questionpro.com/blog/paper-and-pencil-interviewing/
3. Anjum, P. (2020, August 1). 6 Data Collection Methods Researchers Will Love. Retrieved from Fluent Forms: https://fluentforms.com/data-collection-methods/
4. Bastos, J. L., Duquia, R. P., González-Chica, D. A., Mesa, J. M., & Bonamigo, R. R. (2014). Field work I: selecting the instrument for data collection. An Bras Dermatol, 89(6), 918-923. doi:10.1590/abd1806-4841.20143884
5. Bhat, A. (2024). Data Collection Methods: Sources & Examples. Retrieved February 10, 2024, from QuestionPro:https://www.questionpro.com/blog/data-collection methods/#types_of_data_collection_methods
6. Canals, L. (2017). Instruments for Gathering Data. In E. Moore, & M. Dooly (Eds.), Qualitative approaches to research on plurilingual education (pp. 390-401). Research-publishing.net. doi:https://doi.org/10.14705/rpnet.2017.emmd2016.637
7. Chapel, M. J., & Wang, G. (2019). Understanding cost data collection tools to improve economic evaluations of health interventions. Stroke & Vascular Neurology, 1-9. doi:10.1136/svn-2019-000301
8. Dawson, C. (2019). Introduction to Research Methods: A Practical Guide for Anyone Undertaking a Research Project (5th ed.). Little, Brown Book Group.

9. Dobility. (2024). A Guide to Data Collection: Methods, Process, and Tools. Retrieved from SurveyCTO: https://www.surveycto.com/resources/guides/data-collection-methods-guide/#:~:text=The%20method%20selected%20should%20align,particularly%20for%20large%2Dscale%20studies.

10. Formplus. (2023, July 25). 7 Data Collection Methods & Tools For Research. Retrieved from Formplus: https://www.formpl.us/blog/data-collection-method#:~:text=What%20is%20a%20Data%20Collection,tools%20used%20to%20collect%20data.

11. Goyal, A. (2020). Data Collecting Instruments and Tools in Research. International Journal of Creative Research Thoughts, 53-61. Retrieved from https://ijcrt.org/papers/IJCRTQ020011.pdf

12. Haruna, R. (2023, February 13). Instruments of Data Collection. Retrieved from https://researchpages.com.ng/instruments-of-data-collection/

13. HeroVired. (2023, December 21). Data Collection - Methods, Types, Tools, and Techniques. Retrieved from Hero Vired: A Hero Group Company: https://herovired.com/learning-hub/blogs/data-collection-methods/

14. Islam, S. (2024, June 4). Top 9 data collection tools that help take sensible decisions. Retrieved from WP ERP: https://wperp.com/88793/best-data-collection-tools/

15. Jain, N. (2021). Survey Versus Interviews: Comparing Data Collection Tools for Exploratory Research. The Qualitative Report, 26(2), 541-554. doi:https://doi.org/10.46743/2160-3715/2021.4492

16. Johnson. (2020). Methods of Data Collection in Quantitative, Qualitative, and Mixed Research. In Educational Research (7th Ed. ed., pp. 179-206). SAGE Publications, Inc. Retrieved from https://us.sagepub.com/sites/default/files/upm-assets/106363_book_item_106363.pdf

17. Jovancic, N. (2023, May 14). 5 Data Collection Methods for Obtaining Quantitative and Qualitative Data. Retrieved from LeadQuizzes: https://www.leadquizzes.com/blog/data-collection-methods/

18. Kairuz, T., Crump, K., & O'Brien, A. (2007). Tools for Data Collection and Analysis. The Pharmaceutical Journal, 278, 371-377.

19. Kritika. (2024, February 1). How do I justify the chosen methods in my research proposal help? Retrieved from Medium: https://medium.com/@kritika15/how-do-i-justify-the-chosen-methods-in-my-research-proposal-help-6b71a21eac6f#:~:text=A%20well%2Djustified%20methodology%20is,the%20contribution%20to%20existing%20knowledge

20. Laitenberger, O., & Dreyer, M. H. (1998). Evaluating the usefulness and the ease of use of a Web-based inspection data collection tool. Proceedings Fifth International Software Metrics Symposium. Metrics (Cat. No.98TB100262), (pp. 122-132). Bethesda, MD, USA. doi:10.1109/METRIC.1998.731237

21. Liza, U. (2024). Top 7 Best Data Collection Tools in 2024. Retrieved February 11, 2024, from QuestionPro: https://www.questionpro.com/blog/data-collection-tools/

22. Malik, C. (2024). Guide to Communication Research Methodologies: Quantitative, Qualitative and Rhetorical Research. Retrieved from Master's in Communications: https://www.mastersincommunications.com/features/guide-to-communication-research-methodologies#:~:text=Some%20of%20the%20most%20popular,questions%20developed%20by%20the%20researcher.

23. Mkandawire, S. B. (2019). Selected Common Methods and Tools for Data Collection in Research. In K. M. Banja, Selected Readings in Education (Vol. 2, pp. 143-153). Lusaka: Marvel Publishers.

24. Mosweu, O., & Mosweu, T. (2020). Research Methodologies Used in Library and Information Studies Masters' Degree Dissertations at the University of Botswana. In P. Ngulube (Ed.), Handbook of Research on Connecting Research Methods for Information Science Research (pp. 384-403). IGI Global. doi:10.4018/978-1-7998-1471-9.ch020

25. Murairwa, S. (2010). A Hybrid Heuristic Research Framework: The Travelling Salesperson Problem. PhD Thesis, Universiti Utara Malaysia (UUM), Kedah.

26. Murairwa, S. (2014). Voluntary Sampling Design. International Journal of Futuristic Trends in Engineering and Technology, 1(7), 13 - 19. doi:30/08/2014

27. Murairwa, S. (2015). Voluntary Sampling Design. International Journal of Advanced Research in Management and Social Sciences, 4(2), 185-200. Retrieved from http://www.garph.co.uk/IJARMSS/Feb2015/18.pdf

28. Murairwa, S. (2016). Murairwa, S. (2016). RESEARCH AND STATISTICS with application procedures in statistical package for social sciences. India: Research Foundation, Publishers and Subscription Agents of International and Indian Journals.

29. Murairwa, S. (2019). Third Generation Heuristic: Hybrid Erosion And Deposition (HEAD) Metaheuristic. Mauritius: LAP Lambert Academic Publishing.

30. Murairwa, S. (2019b). RESEARCH AND STATISTICS with application procedures in statistical package for social sciences (First Edition ed.). Zimbabwe: Media Essentials.

31. Murairwa, S. (2021). A Heuristic Algorithm Framework for Curbing the Spreading of the Covid-19 Pandemic. Global Scientific Journals, 9(4), 2767 - 2772. Retrieved from http://www.globalscientificjournal.com/researchpaper/LEARNER_RECOMMENDATION_SYSTEM_USING_EDM_FOR_ELEMENTARY_PUPIL.pdf

32. Murairwa, S. (2023). CREATIVE AND INNOVATIVE DECISION MAKING: A Business Survival Strategy in a DVUCA Global Business Environment. Harare: Media Essentials.

33. Proofed. (2023, May 1). How to Justify Your Methods in a Thesis or Dissertation. Retrieved from Proofed: https://proofed.com/writing-tips/how-to-justify-your-methods-in-a-thesis-or-dissertation/

34. Simister, N. (2017). Basic Tools for Data Collection. Intrac for Civil Society. Retrieved February 11, 2024, from https://www.intrac.org/wpcms/wp-content/uploads/2017/01/Basic-tools-for-data-collection.pdf

35. Simplilearn. (2023, September 1). What Is Data Collection: Methods, Types, Tools. Retrieved from Sipmlilearn: https://www.simplilearn.com/what-is-data-collection-article

36. Specta. (2023, January 13). Instruments of Data Collection. Retrieved from Project Writing Services: https://researchpages.com.ng/instruments-of-data-collection/#:~:text=Questionnaires%20(Widely%20used%20in%20both,now%20be%20explained%20in%20detail.

37. Taherdoost, H. (2021). Data Collection Methods and Tools for Research; A Step-by-Step Guide to Choose Data Collection Technique for Academic and Business Research Projects. International Journal of Academic Research in Management, 10(1), 10-38. Retrieved from https://hal.science/hal-03741847/document

38. Tomlinson, M., Solomon, W., Singh, Y., Doherty, T., Chopra, M., Ijumba, P., . . . Jackson, D. (2009). The use of mobile phones as a data collection tool: A report from a household survey in South Africa. BMC Medical Informatics and Decision Making , 19(51), 1-8. doi:https://doi.org/10.1186/1472-6947-9-51

39. UpMetrics. (2022, July 25). 8 Essential Qualitative Data Collection Method. Retrieved from UpMetrics: https://blog.upmetrics.com/essential-qualitative-data-collection-methods

40. Wa-Mbaleka, S. (2020). The Researcher as an Instrument. In Computer Supported Qualitative Research. WCQR 2019. Advances in Intelligent Systems and Computing (Costa, A.; Reis, L.; Moreira, A. ed., Vol. 1068). Springer, Cham. doi:https://doi.org/10.1007/978-3-030-31787-4_3