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Reliable Data Collection: A Tool for Data Integrity in Nigeria

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Walden University

College of Management and Technology

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Stella Tonye Whyte

has been found to be complete and satisfactory in all respects,
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the review committee have been made.

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Walden University

2021

Abstract

Reliable Data Collection: A Tool for Data Integrity in Nigeria

by

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Walden University

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Information Technology

Walden University

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Abstract

Unreliable and poor-quality data is a significant threat to governmental institutions because of its devastating impact on nations' social and economic well-being. Managers in government organizations require reliable data to inform economic planning and decision-making. Grounded in the theory of total quality management, the purpose of this qualitative multiple case study was to explore strategies information technology (IT) managers in sub-Saharan African countries use to ensure the reliability of data. The participants were 12 IT managers in three government establishments in Port Harcourt, Rivers State, Nigeria, responsible for ensuring the data reliability for economic planning and decision-making. The data collection included semistructured interviews of IT managers and analysis of documents ($n = 6$). Thematic analysis resulted in five primary themes: data quality assessment, education and training, use of technology, management and employee involvement, and advocacy and sensitization. A key recommendation is that IT managers conduct regular quality data assessments of collected data to ensure integrity. Managers should also review and update organizational data collection processes to align with global best practices. The implications for positive social change include the potential to ensure appropriate budgeting and resource allocation to states and local governments areas, which may improve the living condition of citizens.

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Dedication

I dedicate this research study to the Almighty God, who gave me the strength to conduct this research. I also dedicate this research to my husband, Mr. Monima Colin Whyte, who supported me all the way, and to my children, Sharon, David, Emmanuella, and Yolanda, who were always there to encourage me on this doctoral journey. They all motivated my dream to cultivate humility, be hungry for knowledge, trust God, listen to my inner voice, and never give up even when things seem difficult; I love you all. Thank you to all my family members, siblings, friends, and loved ones who understood and endured my inability to be present in all gatherings and functions. To my mentor and number one chair, Dr. Steven Vile Case, I love to say thank you for all your patience and the love you show during this process. I wish we had finished this work together, but the Almighty God will surely bless you.

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Section 1: Foundation of the Study

Background of the Problem

Poor data quality could have a devastating impact on the social and economic well-being of a nation. It is important for government, as well as organizations to monitor the well-being of citizens and workers, and take steps to improve their. Periodic, systematic data assessment will offer policymakers a much stronger set of findings to use in making policy decisions (Diener & Seligman, 2004). Governments and other organizations need to improve data quality with adequate strategies, approaches, techniques, and tools to ensure the reliability of data collection. Several governments and organizations are rendering better products and services with the introduction of information technology (IT) with total quality management (TQM; Wahed et al., 2013). It is vital for developing countries such as Nigeria to have reliable and quality data for economic development and accurate decision-making.

Technological advancement has created a higher demand for IT managers to improve strategies to ensure reliability in data collection (Wang & Strong, 2015). These demands and pressures have placed a renewed focus on quality improvement for long-term survival for governments and organizations. The use of unreliable and unrealistic data in most developing countries has resulted in the problem of inaccurate distribution of resources for national development. Decisions made with the use of unreliable data could result to serious setbacks in the economic growth of a nation (Chukwu et al., 2014). IT managers are, therefore, under constant pressure to define strategies to respond to this

persistent challenge (Chukwu et al., 2014). Data collection challenges must be addressed and actions taken to improve the quality of life for millions of citizens.

Problem Statement

Access to accurate, reliable, consistent, and timely data is crucial for decision-making and resource allocation (Grabowski et al., 2016). High quality and reliable data are the key to growing an economy, making quality decisions, reducing poverty, and increasing shared prosperity. Way's 2015 report on the United Nations Millennium Development Goals showed that 61% of sub-Saharan African countries lacked adequate data to monitor poverty trends. Countries like Nigeria and Ghana who are aware of the power of data for decision making still lack accurate data. According to Lynch et al. (2020), the countries encounter challenges along the way, including barriers to data integrity in terms of accuracy, completeness, credibility, and relevancy. The general IT problem is that IT managers in government organizations in most sub-Saharan African countries do not ensure collection of reliable data for economic planning and decision-making goals. The specific IT problem is that some IT managers in government organizations in Rivers State, Nigeria, lack strategies to ensure the collection of reliable data for economic planning and adequate decision-making goals.

Purpose Statement

The purpose of this qualitative exploratory multiple case study was to explore strategies used by some IT managers in sub-Saharan African countries to ensure the reliability of data collection to meet economic planning and decision-making goals. The target population consisted of IT managers and data collectors in government

establishments in Rivers State, Nigeria, who have strategies to ensure the reliability of data collection to meet economic planning and decision-making goals. This study may provide strategies that could be used by IT managers and data collectors to ensure the reliability of data collection in sub-Saharan African countries. Implications for positive social change include more accurate and reliable data collection strategies that may ensure appropriate budgeting and resource allocation to states and local governments areas, which may improve the living condition of the citizens.

Nature of the Study

I used the qualitative research method. Researchers use the qualitative method to understand the meaning behind actions and behaviors and to see the phenomenon from the perspective of the participants (Sinkovics & Alfoldi, 2012). By using the qualitative method, researchers are able to actively engage with participants to see how they perceive the study phenomenon (Coenen et al., 2012). Conversely, the quantitative method is used by researchers to draw generalizations about a population with the use of numerical data to prove or disapprove a hypothesis (Arseven, 2018). In the study, I did not test hypotheses or collect numerical data for statistical inference; this made the quantitative method inappropriate for this study.

Mixed-methods research involves the combination of qualitative and quantitative methods in the same study—for instance, the collection, analysis, and interpretation of both narrative and statistical data (Holcomb & Hickman, 2015). According to Charman et al. (2015), in the mixed-methods approach, researchers design, build, and test theories and complete inductive and deductive analysis within the same study. The mixed-

methods approach is used when neither a qualitative nor a quantitative approach is enough on its own to serve as the research method for the research topic. This method takes a longer time for completion of study as both quantitative and qualitative research methods are employed (Zohrabi, 2013). The qualitative research method alone was a sufficient approach to complete the purpose of this study, which made it the appropriate choice of research method.

According to Yin (2013), researchers use the phenomenological design to study human experience from the view of those living the phenomenon. Phenomenology design was not the most appropriate for this study. The major focus of this study was the strategies used by IT managers to ensure the reliability of data collection to meet economic planning and decision-making goals.

I considered the ethnographic research design for this study but did not select it. Researchers using the ethnographic design study the beliefs, behaviors, and languages of individuals in cultural groups (Draper, 2015). In studies with this design, data collection is done through personal observation of members of a cultural group over a period in their natural setting (Schober et al., 2016). This is time-consuming due to the in-depth study of the cultures. The focus of my research was not on IT managers themselves or their beliefs and behaviors; instead, I explored strategies used by IT managers to ensure reliable data collection for adequate planning and decision-making goals, making ethnography not the best fit for this study. I also did not intend to directly observe how participants interact within their workspace or to study members of a cultural group over a specified period making the ethnographic design also a poor fit.

I chose the case study research design rather than ethnography or phenomenology. I did so because the design emphasizes studying the phenomenon in a natural setting, allowing for consideration of natural occurrences (Yin, 2013) Case study research also focuses on describing the complexity of the phenomenon of interest in a study.

Research Question

What strategies do some IT managers in the sub-Saharan African countries use to ensure the reliability of data collection to meet economic planning and decision-making goals?

Interview Questions

The case study will consist of semistructured interviews and document reviews involving at least four IT managers from three government organizations in Rivers State, Nigeria. At the beginning of each interview, I will ask the following demographic questions:

1. What is your name?
2. How long have you worked for the government in this organization?
3. What role do you play in the data collection processes?

Each participant will then be asked the following 10 interview questions. The questions are documented in the interview protocol as shown in Appendix A.

1. What strategies are you using in your ministry to ensure reliable data collection?
2. How did you implement these strategies to ensure reliable data collection in your organization?

3. What is your role in managing and implementing these strategies and why?
4. What are the changes in strategies while ensuring reliable data collection in your ministry?
5. What challenges did you face with reliable data collection for decision making in the ministry and why?
6. What strategy and method of success did you use to achieve reliable data collection?
7. What were your main concerns in your approach to ensure reliable data collection?
8. What infrastructure did the ministry put in place to achieve success?
9. What was the setback you may have had in order to apply the strategies you did in relation to manpower and tools use?
10. What other information would you like to add regarding reliable data collection strategies in Nigeria?

Conceptual Framework

The conceptual framework used in this study was the theory of TQM. TQM evolved from the modern management theory of Frederick Winslow Taylor. Taylor asserted that it is a management obligation to design good jobs and provide incentives for workers' motivation to achieve higher productivity. Taylor popularized modern management more than any other figure in management (Dent & Bozeman, 2014). TQM's focal point is achieving high levels of satisfaction for customers through staff's involvement in the organization and continuous improvement (Suryanarayana et al.,

2015). The modern management theories encourage collaboration, trust, foresight, listening, and the ethical use of power and empowerment to improve the individual and the organization's life condition. Jiménez-Jiménez et al. (2019) provided a framework to show how market orientation (MO) and knowledge management (KM) play a mediator role between TQM and innovation in the implementation of TQM organizational systems.

Americans such as W. Edward Deming, Joseph Juran, and Kaoru Ishikawa developed the TQM concept in Japan in the early 1940s. In the 1980s, a new phase of the TQM concept on quality management began based on the upgrade in processes, goods, and services with all stakeholders' creative involvement (Neyestani, 2017). As Barata and Cunha (2015) showed, ISO 9000, Six Sigma, and CMMI are contemporary methods that implemented TQM as a framework.

TQM is an approach to quality that is now conceptualized as regarding an organization's integrated, systemic strategy to improve product and service quality (Suryanarayana et al., 2015). I used the TQM theory in this study to conceptualize the relationship between IT resources and the management of workers. The theory allowed me to better understand strategies that IT managers in Rivers State use to improve productivity and reliability in terms of data collection and refine their expertise through continuous improvement. The quality and integrity of data are essential to the overall provision of organizational effectiveness in service delivery. As a conceptual framework for this study, TQM theory was helpful in exploring how managers use quality data from reliable data collection processes to analyze and measure system improvement.

Organizational leaders use quality control and continuous process improvement philosophy as a TQM concept to improve efficiency and effectiveness in sustaining competitive advantage and profitability (Prajogo et al., 2016). By having IT managers focus on quality management and continuous improvement, the government and organizations could establish and uphold cultural values, processes, and services that create reliable data collection strategies for long-term planning and decision-making. This framework's application comprises the strategies, methods, and systems by which IT managers collect, store, analyze, improve, and maintain data quality. Some key concepts underlying the conceptual framework include data quality, data governance measurement, data tools, and data quality analysis.

Definition of Terms

Data integrity: Consumer expectations about data about safety and accuracy of data (Imran et al., 2017).

Data quality: The expectation that data are reliable and effective for its intended use in operations, decision-making, and planning (Imran et al., 2017). *Data quality* refers to provenance-based data integrity checking and verification in cloud environments.

Qualitative data collection: The selection and production of linguistic materials for analyzing and understanding phenomena, social fields, and subjective and social meaning. (Aspers & Corte, 2019).

Assumptions, Limitations, and Delimitations

Assumptions

Assumptions are facts in a study that may not be proven to be true. This is the researcher's belief of something without a proof (Yang et al., 2018). My first assumption was that participants would answer questions in a truthful and sincere manner during the interviews. Second, I assumed that the information provided by the participants would be relevant and accurate to answer my research question.

Limitations

Limitations are a potential weakness in a study. As defined by Busse et al. (2016), limitations involving decisions made regarding the research design or methodology impact the generalizability of the research outcome. Although this research was carefully prepared, I am still aware of its limitations and shortcomings. First, the population sample was small and might not represent most IT professionals and data collectors in the state or adequately reflect the whole country. Despite the narrow coverage, the results may provide insight on strategies of data collection in other settings, particularly where similar situations are observed. There is need to explore what happens in other parts of the country.

Delimitations

Boundaries set by a researcher on a study to control the scope of the research are referred to as delimitation (Singh, 2015). Delimitations of a study, as defined by Newman et al. (2015), are those conscious exclusive and inclusive boundaries observed by the researcher during the development of the study. My research has few delimitations. First,

I used only government establishments for this study. Second, only ministries that collect large data and have at least six IT personnel were engaged for this study. Third, only IT managers and data collectors who are full-time employees of the government for at least 3 years were chosen for the research.

Significance of the Study

I found no matching studies while reviewing the academic literature for research regarding strategies used by IT managers to ensure the reliability of data collection. Considering the aspects of quality defined in TQM with the responsibilities of IT managers, both academic knowledge and practice in this area of reliable data collection could be enhanced. I expect that this study may lead to further research on the topic.

Contribution to Information Technology Practice

The results from this study could enable strategic management in government and other organizations that allows IT managers to perform better while improving their living conditions and enhancing organizational performance. These strategies may assist government and organization leaders in retaining skilled professionals, including IT professionals, as well as furthering corporate support sustainability. Implementing the strategies used by IT managers could be a decision-making standard in government and organizations that may end up determining objectives, policies, and plans to achieve sustainable development goals.

Implications for Social Change

The adoption of these strategies may effect social change in some sub-Saharan Africa by improving reliable statistical data. This may promote economic development

by increasing resources for public policy analysis, design, implementation, and decision-making. The study could also influence IT professionals to retain employment with the government or outside organizations where they may be able to ensure the reliability and quality of data collection thus increasing the potential for corporate social responsibility. Researchers may use the findings of the study to develop a greater understanding of strategies employed by IT managers to ensure the reliability of data collection in all sectors of the society.

A Review of the Professional and Academic Literature

The purpose of this qualitative exploratory multiple case study was to explore strategies used by some IT managers in sub-Saharan African countries to ensure the reliability of data collection to meet economic planning and decision-making goals. Data are crucial to determine the authenticity of any research output in order to ascertain quality planning, development, and decision making. It means that unreliable data could lead to questionable data validity, which will ultimately result in planning errors, issues with economic development, and inaccurate decision-making (McGraw & Mandl, 2021). Reliable data collection is needed for accurate implementation of government and organizational policies as well as for the implementation of developmental change in the society.

I used ProQuest, EBSCOhost, Google Scholar, IEEE, SAGE, Science Direct, and other databases from Walden University Library as part of my literature search. My research question was, What strategies do IT managers in government organizations in Nigeria use to ensure the reliability of data collection to meet economic planning and

decision-making goals? According to Galvan and Galvan (2017), researchers write literature reviews to inform readers about the existing research and to obtain their own in-depth knowledge of the research topic. I used key words and phrases such as *reliable data collection*, *total quality management (TQM)*, and *data integrity* in my database searches. I used a literature review matrix to track all literature sources related to my search of the professional and academic literature on reliable data collection. My review of the academic literature consists of 116 journal articles on data collection, data integrity, data reliability, and TQM theory as the underlying conceptual framework as shown in the Table 1.

Table 1

Summary of Articles in the Literature Review

Section	Total	Within 5 years	Peer-reviewed	Percentage peer-reviewed	Percentage within 5 years
Literature review	116	98	109	93	84
Complete study	178	157	164	92	88

Most (92%) of the 178 articles in the study are peer-reviewed, as verified through Ulrich's Periodicals Directory, and 88% of the 178 articles were published within 5 years of my anticipated graduation in 2020. The review is organized into eight categories: (a) evolution and review of TQM, (b) acknowledgment of TQM in reliable data collection, (c) evolution of similar theories of TQM, (d) related research on TQM, (e) challenges of reliable data collection in sub-Saharan Africa, (f) impact of reliable data collection on

economic development, and (g) impact of technology on reliable data collection strategies.

Total Quality Management

TQM depends on the success of individual tasks. Khalil et al. (2015) noted that Henry Ford and Frederick Winslow Taylor influenced quality by applying a scientific methodology to work tasks. TQM is about people involved in all areas of an organization in the delivery of quality (Joyce, 2015). TQM is the shift in responsibility for quality from employees to all stakeholders. Some researchers have asserted that quality is a culture composed of the constant drive to quality, training, leadership, and teamwork, and involving everyone (Omar, 2017). Deming (1985) defined TQM as a set of strategies used to reduce or eliminate variations from production processes or service delivery systems to improve efficiency, reliability, and quality. The adoption of TQM as a framework in this study is significant as quality is considered a critical strategic factor in achieving reliable data collection (Joyce).

TQM became a central focus in the 1990s as the management of companies in the United States faced intense competition from their Japanese rivals (Joyce, 2015). Organizations began adopting Deming's and Juran's ideas of TQM that they had shared with the Japanese after the Second World War in a bid to experience some of its acclaimed benefits. Deming and Juran, among several gurus, made valuable contributions to the theory and practice of TQM. Deming proposed the TQM concept in 1940, but its use did not begin until 1985 (Neyestani, 2017). Deming prescribed 14 points that serve as guidelines for organizational behavior and TQM practices. The fourteen points are (a)

achieve the constancy of purpose, (b) adopt the new philosophy, (c) cease dependence on inspection, (d) offer the lowest tender contracts, (e) continually seek out problems, (f) institute training on the job, (g) institute supervision, (h) drive out fear, (i) break down barriers, (j) eliminate exhortations, (k) remove targets, (l) permit pride of artistry, (m) institute education, and (n) facilitate the commitment of top management (Khalil et al., 2015). Deming further postulated the plan-do-check-act or PDCA cycle, whose adoption led to performance excellence in organizations (Mishra & Sharma, 2014; Zimnicki, 2015).

TQM theories could enable business leaders to improve data quality through quality production, service systems, standardized training, management, and employee involvement. TQM critical points include eight elements. These are (a) consistency creation within processes for product improvement; (b) become quality-centric, thereby removing mass inspection; (c) no performance-based reward on low price; (d) adoption of continuous improvement, improving quality, and cost reductions; (e) on the job training; (f) synergizing both employee and stakeholders in the organization; (g) removal of unproductive competition within departments and improve systems quality control; and (viii) elimination of quotas (Deming, 1982).

TQM is a continuous process used to measure and evaluate methods to understand if the intended objective is achieved. Asif et al. (2013) qualified this critical factor of the TQM process as to what gets measured and managed to explain the importance of measuring and evaluating TQM initiatives. Singh and Singh (2015) agreed that sustaining

the TQM process of monitoring and evaluation against strategic objectives should be based on improvement activities.

Acknowledgment of Total Quality Management in Reliable Data Collection

The TQM concept is quality control and continuous process improvement philosophy that organizational leaders use to improve efficiency and effectiveness to sustain competitive advantage and profitability (Prajogo et al., 2016). The adoption of TQM is significant as quality is considered a critical strategic factor in achieving reliable data collection. IT managers in most organizations seek ways to improve data quality by using the TQM as a quality improvement concept (Olkiewicz, 2018). TQM focuses on enhancing employee engagement, better communication, higher output, better quality, lower costs, competitive advantage, and superior customer satisfaction (Arshad et al., 2016). As the global marketplace becomes more entrenched, levels of competition have resulted in quality becoming relevant to organizations, and Six Sigma. TQM has become a critical management issue. A considerable number of companies are applying TQM, and the topic has become the subject of global discussion. TQM appears, therefore, to be well accepted as a management system (Erickson et al., 2015).

The forefathers of quality, Deming (1985), Juran (1985), Crosby (1982), Feigenbaum (1985), and Ishikawa (1984), all contended that successful quality management requires senior management commitment and should involve everyone in the organization. According to Omar (2017), Deming stated that TQM quality improvement concept is holistic and could be used by IT managers in all departments of government organizations to improve quality. Continuous improvement as a policy of

TQM relies on people of all levels in the organizations' hierarchy. The forefathers of quality did agree on continuous improvement as a means of addressing quality. In achieving quality, Deming (1982) stated that the best approach is in continuously improving the organization while Juran and Godfrey (1999) and Feigenbaum (1985) agreed that improvement of management and leadership is the best. Juran and Godfrey, Crosby, Feigenbaum, and Ishikawa ascertained that what is required in successful quality management is the commitment of senior management. Juran and Godfrey and Crosby mentioned that senior management should also be members of quality committees and that focus on quality efforts will be a failure if left in the hands of the lowest organizational hierarchy levels. According to Deming (1985), quality is a culture composed of the constant drive to quality, training, leadership, teamwork, and the involvement of everyone in the policy of TQM.

This study results show that the application of TQM in government and organizations could improve their operational tasks for quality data collection and hence increase reliable data output. The implementation of TQM in organizations could also allow IT managers to use safe data collection strategies to increase quality awareness, improve staff performance, and reduce quality costs (Joyce, 2015). Shankaranarayanan and Blake (2017) stated that effective implementation of quality measures and accurate data must be obtained promptly to check needed performance measures.

Shankaranarayanan and Blake further noted that understanding the gaps in data collection and taking informed steps to close these gaps will require real-time communication of relevant information to enable the coordination of services like health care across the

health care system while Doshi and Desai (2014) used the measurement system analysis from TQM principles for continuous quality improvement in automobile small-to-medium enterprises (SMEs) to access the gaps in quality data collection.

Evolution of Theories Similar to Total Quality Management

I compare the historical evolution of TQM with eight well-known management theories to clarify the relationship between TQM and the management theories selected. Dahlgaard-Park et al. (2018) used the EFQM excellence model (EEM) concept and core values as the framework for their analysis. The reports show that the core values of harnessing creativity and innovation vital to TQM were not fully integrated into the management theories. The study reveals that the TQM framework does not only embraces the most critical components which are identified in other major management theories but also incorporated some emerging managerial aspects that are becoming increasingly important. The EEM is used by managers and academics as a proxy to implement TQM. Gomez et al. (2017) noted with empirical analyses that companies, when implementing the EEM as a management tool, are also indirectly using the TQM. This shows that EEM and TQM, although not the same, follow a similar pattern so that companies with high grades at EEM will also score high as a TQM company.

Several contemporary organizations implement TQM in the form of ISO 9000 and Six Sigma (Barata & Cunha, 2015). Several modern processes and frameworks for continuous improvement of quality initiatives are based on TQM principles. Topalović (2015) stated that quality must have proof of international standards in the eye of the user and ISO 9000 certification as a model is to establish that proof. Barata and Cunha (2015),

with Joyce (2015), acknowledged ISO 9000 as a set of international standards for quality management and assurance and saw it as a blueprint for implementing the quality system across the entire product life cycle. Barata and Cunha stated that both ISO 9000 and TQM could be used to implement and create a practical quality management framework. Digalwar et al. (2014) found that ISO 9000, as an integral part of quality management frameworks, should be implemented before implementing a quality management solution because it cannot be implemented alone as stated by some researchers.

Six Sigma is also seen as a quality improvement framework (Raja et al., 2018). According to Raja et al., Six Sigma is sometimes referred to as a TQM method and as a business process to improve quality, reduce costs, and increase customer satisfaction. Juran and Godfrey (1999) asserted that implementing Six Sigma was not the best means to maximize quality, the reason being that it is a new label placed on an old principle and therefore is just a blueprint for a possible implementation of TQM. Cronemyr and Danielsson (2013) added that whether it is a new framework or not, Six Sigma has qualities that align with TQM's statistical analysis.

Herzberg's motivational theory is an extension of Maslov's (2017) philosophy, which states that recognition, responsibility, achievement, advancement, and work motivate people. The approach is based on motivation, which is interrelated and supports the TQM concept. The total data quality management (TDQM) theory provides a methodology to ensure data quality through motivation as an adapted version of the Deming cycle, although it is not easy to apply in several situations as researched. The TDQM methodology features a version that directs data quality in defining, measuring,

analyzing, and improving data (Liu et al., 2021). High-quality data enables business analysts to find proper insights into production and service process and propose ways of improving data (Olkiewicz, 2018).

Haffar et al. (2019) used the evident relationship between organizational culture (OC) and TQM to extend prior research on TQM by building and testing a theoretical model which includes a facilitating role of employee readiness for change dimensions (ERFCs) in the OC–TQM relationship. The findings show the mediating functions of ERFC, which are self-efficacy (ERFC1) and personal valence (ERFC4) of the OC–TQM relationship. Haffar et al. (2019), however, argued that improvement in TQM implementation is not in direct support of organizational culture. Still, it entails self-efficacy and is a unique force to transfer the ability of an organization and organizational philosophy to TQM. Barata and Cunha (2015) defined TQM as a philosophy that imposes a systematic view of managing an organization for the purpose of continuous process improvement. I chose TQM as the fundamental theory for this study because of its role in data quality improvement, its increased quality awareness, and its reduced quality costs compared to related theories.

Related Research on Total Quality Management

Arshad et al. (2016) reviewed TQM's role in reliable data collection is in quality improvement, increased quality awareness, and reduced quality costs. Several quality-oriented organizations worldwide have adopted TQM practices to improve quality, productivity, customer satisfaction, and profitability. Anu and Satish (2019) investigated the direct and indirect effects of TQM practices on various performance indicators on

organizations, and results show that implementation of TQM practices reaped the TQM benefits in every area of an organization.

Organizations incline toward continuous improvement more than innovations. Kumar and Sharma (2018) agreed with Nasim (2018) in stating that the TQM conceptual framework model focuses on both internal and external factors for organizational performance. The inclusion of external and internal factors in any research will have a severe impact on TQM principles on an organization's performance. According to Nasim, the challenges in obtaining total quality and bringing out the framework for integrated relationships is based on several constituent models. A conceptual framework should therefore be developed for TQM factors, organizational performance, and innovation. Hilman et al. (2019) deduced an empirical test in the association between TQM and the performance of SMEs. The result of the study showed a positive and direct effect of TQM and organizational culture (OC) on SMEs' performance with a significant and an indirect impact of TQM on SMEs' performance.

TQM implementation has a more reliable and positive effect on service quality than service innovation (Arshad, et al., 2016). Other studies on the impact of TQM like Kumar and Sharma (2018) stated that the TQM principle, practices, and techniques could also be applied to all areas within an organization, including information systems, marketing, finance, and research and development. Hypothesis and conceptualization of the relationship between TQM practices and innovation are described in a comprised model of top management leadership, employee involvement, employee empowerment, customer focus, training, information analysis, and continuous improvement, which is an

independent variable. Basnet (2018) examined and revealed the impact of TQM practices on employees' job involvement in the Nepalese manufacturing industry and how customer focus, training, education, teamwork, and organizational culture are positively associated with employees' job involvement. TQM contribution is seen on employee's performance from the research literature of both authors to a better understanding of the association between TQM practices and employees' job involvement. Bajaj et al. (2018) stated the impact of TQM on business performance and its effect on people in business, professionals, managers, and practitioners. Research scholars for 20 years have used Pareto Analysis, as a quality tool to develop a model that has helped researchers and academicians clear understanding of TQM in a different sector. Ntwiga et al. (2019) further researched the influence of continuous quality improvement on patients' satisfaction within hospitals in Nairobi, Kenya.

Calvo-Mora et al. (2015) made contributions to the TQM approach and the EFQM Model framework observed the influence of TQM's social factors on organizational results. Studies show that TQM social factors provide a bedrock on the success of the quality system as Honarpour et al. (2018) examine the effect on the process and product innovation and the reciprocal relationship between the total quality management (TQM and knowledge management (KM). The study provides empirical evidence of a reciprocal relationship between TQM and KM, revealing that R&D firms implementing TQM with KM can efficiently and innovatively manage their activities. Bouranta et al. (2019) identified TQM factors and their impact on internal and external customer performance measures in different countries. These performance measures:

quality practices of top management, customer focus, process management, employee quality management, and knowledge and education of the employee show that TQM elements are antecedents of the customer- and employee performance-focused. Multinational organizations could use these factors as an instrument to access TQM implementation nationwide by benchmarking their performance.

Bouranta et al. (2019) stated that the lack of applying TQM technique in organizations could affect poor performance and inability to compete and thus cripple the organization. The implementation of TQM practices increases competitiveness in companies, consumers' satisfaction, and business performance. According to Ramlawati and Putra (2018), when organization competitiveness improves, the organization increases financial performance. Going beyond previous research and contributions in explaining the underlying psychological mechanisms of the OC–TQM relationships model, Haffar et al's. (2017) study proved the mediating role in OC–TQM relationship with ERFCs. The two dimensions of ERFC; self-efficacy (ERFC1) and personal valence (ERFC4) in the OC–TQM relationship, show that TQM implementation does not directly support organizational culture.

Applications of Total Quality Management

Radio frequency identification (RFID) is a fast-evolving technology used in data collection and transfer in supply chain management to increase efficiency in organizations (Green et al., 2019). RFID is a technology that captures digital data encoded in smart labels and RFID tags through a reader via radio waves. RFID serves a similar purpose to that of both bar code or the ATM card magnetic strip where data is

capture by the device from a label or tag and later stored in the database. RFID technology could be focal in the prevention of data inaccuracies, preventing organizations from collecting incorrect or outdated data (Temjanovski & Bezovski, 2020). The RFID is a means of increasing responsiveness, thereby improving organizational performance basically in data collection, data dependencies, and visibility. The implementation of RFID technology can result in improved organizational agility resulting in improved performance. Green et al. (2019) stated that the utilization of RFID technology in the organizational agility model in-corporates a measure of TQM's supply chain performance in an expanded mode. This utilization will enhance organization's ability to respond to changes through improved agility, leading to improved operational performance.

Quality as a culture should be seen as a philosophy that imposes a systematic view of developing an organization for continuous process improvement (Deming, 1982). Collected quality and reliable healthcare service data in government as emphasized by Yourkavitch et al. (2018), should inform decision making, planning, and implementation correctly to evaluate performance and outcomes in healthcare delivery as a culture. Al-Shdaifat's (2015) claims that the implementation of TQM in hospitals shows that 70% of the effect of nurses' socio-demographic variables can be achieved with TQM's application following its principles, including continuous improvement, which could enhance reliable data collection, teamwork, training, top management commitment, and customer focus.

The use of data quality assessments (DQAs) affords developing countries the opportunity to collect reliable information about healthcare service data. DQA provides a

data quality profile and allows users to collect information on healthcare service data to evaluate data quality characteristics with accuracy, consistency, and data timeliness on reports (Yourkavitch et al., 2018). The emphasis is that in data-driven decision-making, stakeholders must know that the quality of healthcare service data is critical. Dukes et al. (2015) used DQAs to determine sufficient data quality to support its intended use. The guidance was given on how to conduct DQAs for community-based interventions in areas where an integrated community case management (iCCM) program is limited. Results from the study show that data quality must refer to the degree to which the data collected measure what they intend to measure.

DQAs stimulate improvements to health management information systems with evidence from five African countries, as examined. Dahlgaard-Park et al. (2018) and Yourkavitch et al. (2018) agreed that the healthcare service data used to inform decision-making, planning, implementation, performance evaluation, outcomes, and healthcare interventions requires high-quality data and practical DQA. The three attributes of data quality: completeness, accuracy, and timeliness need to be in place to evaluate the impact of data accurately, data use, and data collection process for overall DQA. According to Haffar et al. (2019), the application of continuous quality improvement on patients' satisfaction in hospitals has significantly increased. Small- and medium-scale industries play a vital role in the monetary growth of a nation. Nallusamy (2016) reviewed the application of TQM practices in these industries and proposed a comprehensive model that could be explored to play a significant role in assessing the quality levels in

organizations. All over the world, small- and medium-scale industries play a vital role in the monetary growth of a country.

Related Research in Sub-Saharan Africa

Bad data produces adverse analyses, result in misleading interpretations, and misleading interpretations lead to a type of knowledge that is distinctively different from real and objective knowledge (Kinyondo et al., 2019). Problems of data collection precision could be solved by adequate training of data collectors on the use of modern devices. Kinyondo et al. (2019) recommended an increase in the precision of the collected data and analysis to ensure the best possible interpretation of results for accurate decision making and planning.

The importance of reliable data collection applies to every area of our daily life. Data collection processes are mostly inefficient and error-prone when untrained existing field workers are used for data collection in companies, non-governmental organizations (NGOs), and government. There are several areas where this study is applicable, for example, banking, agriculture, health, education, microfinance, and governmental services. I will focus on government services for the scope of this paper due to my familiarity with the domain. Related works were considered which, has focused on the problem with different assumptions about reliable data collection. Gimbel et al. (2017) used a consolidated framework to improve data in government health facilities of Rwanda as a survey tool for mobile devices to addressed errors occurring in the manual data entry which lacked validation by putting the data collection in an electronic form.

The use of big data and emergency management framework accesses the growth of vast complex datasets, referred to as big data, and various development in information and communications technology. Big data computing enables more effective approaches to economic relief, planning, disaster management, and long-term recovery of natural disasters and emergency events (Song et al., 2020). The framework has a significant increase in the frequency, intensity, and impact of data collection on natural disasters and other emergencies. It is forced by governments around the world to make an emergency response and disaster management national priorities. The Consolidated Framework for Implementation Research (CFIR) by Gimbel et al. (2017) is used as a guide in Mozambique, Rwanda, and Zambia to introduce strategies to improve quality and evaluation of routine data collection at the primary health care level and to stimulate its use in evidence-based decision-making. DQA and improvement activities are described and categorized to improve data quality. Gimbel et al. (2017) suggest that successful data quality improvement efforts will engage health workers in data collection, cleaning, and analysis of real-world data to provide skills or on-site mentoring.

The low penetration of Internet and phone service in the Sub-Saharan Africa's is a serious challenge when conducting surveys which limits the number of survey modes available. The upgrade of innovative communication hardware and software has improved the quality of data collection tasks, with a significant contribution to the per capita income of Sub-Saharan Africa's GDP growth indices in mobile phone penetration (Haftu, 2019). Kumpel et al. (2015) implemented a mobile phone application to facilitate water quality data collection within the national public health agency in Senegal, Service

National de l'Hygiène. The study results indicate that mobile phones' used to transmit not only water quality data will likely improve the effectiveness and sustainability of water quality monitoring in Senegal.

Critical Evaluation of Themes

Quality data are vital for government and institutions to provide accurate planning, funding, and evaluation of developmental activities. When the data supply side is reliable, there is hope for decision-makers at all levels as there will be increasing demand for relevant information for policymaking and budgeting (Rimando et al., 2015). Developing countries that lack reliable data struggles to set and evaluate policies to search for solutions. Some researchers consented that the lack of reliable data collection is a significant obstacle to propagate active decision making and economic development (Holten & Brenner, 2015). A resource allocation database should be created to support resource allocation using public and private information sources. For IT managers to produce reliable data, standard data and metadata must be defined, classified, and cross-referenced. Governments and organizations should fund projects and create institutions that can provide accurate and unbiased data to improve quality data collection processes (Grabowski et al., 2016). There is an increase in demand for accurate data in recent times by citizens to find new opportunities and agitation for accountability.

Users are motivated by the satisfied need for data usage when national data are coordinated, not biased, and not emotion driven (Olubusoye et al., 2015). The adoption of TQM as a framework is significant as quality is considered a critical strategic factor in achieving reliable data collection. The forefathers of TQM in their definition of quality

stated that quality has value, conforms to specifications, and meets or surpasses customers' expectations.

Challenges of Reliable Data Collection in Sub-Saharan Africa

Other studies have been conducted on implementation strategies for workplace data collection, data collection strategies, and measurement tools to assess academic and therapeutic outcomes in schools. My review of the literature indicates that researchers have not conducted many qualitative studies on strategies to ensure data collection reliability. The use of the qualitative methods was obliged to capture involvement of, and perceptions from, stakeholders across all levels of the reporting system in some sub-Saharan African countries, like Nigeria, to access how networks function (WHO, 2015). Erickson et al. (2015) agreed with WHO's (2015) report that qualitative data collection enables authors to learn more about the data quality challenges associated with the collection, management, and reporting systems in place.

Data are essential when they contribute to innovation and create value, not the volume of its content. When processed innovatively, data possess value to bring new economic and social benefits to create useful data-based decision-making and analysis. Data is valuable when it can be measured with the socioeconomic metrics it generates and the lifeline in decision-making and raw material for accountability. Gunawan (2016) stated that data must be protected and kept private according to the HIPAA regulations (p. 7). Although the U.S. healthcare industry places importance on the need for quality, poor and inaccurate data impedes the delivery of superior healthcare services. Government and organizations will not know the number of children born in an area,

death rate, sex, and children in the poverty line, how many public schools to build, amount to spend, what companies are in business, and whether the economy is growing. According to Gunawan (2016), lack of reliable data could cause difficulty in designing, implementing, monitoring, and evaluating programs aimed at both the development and security of a nation.

Several challenges are impeding the improvement of reliable data collection in sub-Saharan Africa, including politics, lack of technical capacity, lack of standard metrics, corruption, processes, funding, limited autonomy, and unstable budgets. Several factors can affect the quality of data collected, such as inappropriate or inadequate data collection instruments, procedures, manpower, poor recording, reporting, and errors in data processing. DQAs play a significant role in determining if data meet the quality required to support its intended use, identifying data quality challenges, and providing recommendations to improve the quality of data. Inaccurate data, access to, and poor usability could also lead to misaligned incentives by either the government or an organization (Rimando et al., 2015). In 2013, The Chairman of the National Population Commission (NPC), resigned from his position stating that no population census has been credible in Nigeria since 1816, due to the politicization of the process in the country (Bangbose, 2009). Most African governments, like Nigeria, experience constant data collection challenges because of politicization. The amount of funds received from states and local governments determines the population's statistics as several competing interests amongst stakeholders' interests compromise data integrity in some sub-Saharan Africa (Beguy, 2016).

The leading cause of poor, unreliable data collection across a variety of sectors is first, the use of politicized data collection and statistics processes (Olubusoye et al., 2015). Other challenges of collecting reliable data in Africa are the weak capacity to collate, manage, and distribute data as low levels of education and constrained budgets have limited the technical ability of some data collectors. Variations in data collection and analysis in Africa could be caused by a lack of methodological standards, which is another challenge to reliable data collection. For instance, variations in data collection methodologies led to vastly different death estimates for malaria in Nigeria. The practice of development and implementation of maturity models could improve processes in government and other organizations (Yourkavitch et al., 2018). Research on data quality originated in the 1990s, with different definitions of data quality proposed by researchers, the group of MIT lead by Professor Richard Y. Wang. TDQM has undergone in-depth research in the data quality area (Cai & Zhu, 2015). The group defined reliable data as fitness for use. According to Erickson et al. (2015) the collection of data, whether biological or survey, could present several unique operational challenges, like obtaining and maintaining buy-in from workplace leadership, securing and using workspace for collection activities, recruiting participants, setting, completing appointments, collecting, and processing these data. Way (2015) opined that lack of reliable data had been a severe issue to the nation's growth at every level, thereby hindering adequate and effective health care services, education, population census, and election results Nigerians.

The source of data should and accurately represent reliability and internal consistency. Uddin and Hossain (2015) examined the advancement of technology and

globalization stimulated in the approach to modern management to fit into scientific management by supplementing the human factor and their contributions within an organization rather than substituting the traditional approach to data collection.

Therefore, Uddin and Hossain recommend that scientific and modern methods be applied in data collection to advance technology and improve data collection strategies. To reduce the challenges in ensuring reliable data collection, a new conceptual approach should be aimed to configure collection. Holten and Brenner (2015) in agreement with Uddin and Hossain (2015) argument described and illustrated a framework for contextual data collection challenges and suggested ways of addressing them by using mixed-method contextual studies of patients with chronic disease in two regions of the United States of America. Holten and Brenner (2015) discussed other challenges in research logistics and procedures such as recruitment, travel distances, and compensation. Scientific quality and interpretation of data is also a growing challenge of validity, reliability, and the combination of data from multiple sources. Data collection is an essential aspect of social research processes and therefore enhances the quality of research if correctly managed and implemented (Rimando et al., 2015). Lack of empirical studies and the impact of individual readiness of change (IRFC) is a result of a lack of investigations in empirical studies (Haffar et al.,2019). Holten and Brenner (2015) consented that the lack of reliable data collection is a significant obstacle to propagate active economic development.

The Economist (Nov. 13, 2014) source of analysis on international business and world affairs states that the world sees African as the continent of missing data. This is

one reason why developing countries who lack reliable data struggles to set and evaluate policies to search for solutions. Grabowski, et al. (2016) opined that a resource allocation database should be created to support resource allocation using public and private information sources. Grabowski et al., (2016) stated that in producing reliable data, standard data and metadata must be defined, classified, and cross-referenced. Pal et al. (2017) iterated that data collectors must know the data collection fields before collecting data to enable a test of previous work done to make amendments to correct methodology for future use. Some researchers argue that not meeting the timeline for data collection allows data to be expired for the immediate purpose and becomes irrelevant for use, which is equally a problem. Data collectors must remember that appropriate measures should be designed to collect specific data for any study, stating that project financing could also hinder data collection progress. This challenge could affect the quality of data when data collectors compromise with insufficient funds for the project. The issue of logistics and human error are other problems of data collection.

Lack of equipment and adequate data collection facilities is vital, as all necessary gadgets, tools, and materials to facilitate accurate data collection processes must be made available. Unfortunately, not all personnel used for data collection in Nigeria are either trained or qualified for the task as scientific misconduct or fraud is inevitable. Unqualified personnel are also a problem of data collection as it will hinder accurate expected results, and sometimes data can be influenced by data collectors in order to speed up the process to meet target time. Ananti et al. (2018) highlighted some challenges of data collection in Nigeria, iterating that one of the challenges of Fiscal Federalism in

Nigerian is that there is not yet an acceptable formula to share resources among the three levels of government in Nigeria. There is the problematic dilemma of the allocation of centrally and equitable allocation of collected revenue among all the levels of governments. Often the lack of reliable data collection for adequate decision making and objective analysis had impaired, rather than improved the problem of revenue sharing among states and local governments (Chukwu and Mbaeri (2017). All data collection projects must be adequately sponsored financially by management, and data collection personnel must be well trained, qualified, and experienced to make positive impact in national development. The appropriate verification process must be carried out before, during, and after the data collection project to avoid fraud Ekeu-wei (2018) and Way (2015). Provide adequate equipment for all data collectors with suitable materials and tools necessary for the project.

To implement adequate, affordable, accessible, and clean energy plan, there must be a reliable data collection and up-to-date data. Chukwu and Mbaeri (2017) mentioned that there is always a challenge in collecting energy data in Nigeria due to lack of expertise on energy data collection, the absence of appropriate legal instruments to aid data collection, and security issues ailing the country at present. The challenges associated with hydrological data collection in Nigeria could result in uncertainties. They may cause negative flood frequency estimates there by giving errors on estimates used to inform flood management decisions. Ekeu-wei (2018) stated that the challenges associated with hydrological data collection include: institutional gaps, lack of maintenance of hydrological infrastructure, poor data management, destruction of

equipment during floods events could restrict access to reliable data collection in developing regions. According to Chukwu and Mbaeri (2017), energy data could be sourced in Nigeria through primarily government establishments with few private-sector data collection methods for organizations like, stakeholder engagement meetings, synergy among organizations, workshops, and seminars, and through collaborations among state and non-state actors in the energy sector.

Data collection's importance as an aspect of social research processes enhances the quality of research study if correctly managed and implemented (Rimando, et al., 2015). Beguy (2016) in concurrence with Rimando et al. (2015) calls on policymakers in Africa to use evidence-based research for development decisions with rigorous and reliable data collection with a coordinated system for delivery. Beguy (2016) further stated that reliable data collection for a country to enhance specific development goals and improve citizens' socioeconomic condition like Nigeria as one of Africa's largest economies must be reliable, accurate, and timely. The challenge of unreliable, inaccurate, and untimely data, as researched by Beguy, could be due to the lack of use of data culture. To improve quality data collection processes, and organizations should take the following actions:

- Government and organizations should fund more projects.
- Create Institutions that can provide accurate and unbiased data.
- Prioritization of core attributes of data building blocks, which must include accuracy, availability, timeliness, and relevance.

The government and stakeholders are to initiate these changes Beguy (2016). Adequate resources should be made available by the government and organizations in Sub-Saharan Africa to ensure accurate data collection with to improve data quality.

Impact of Reliable Data Collection on Economic Growth and Development

Data collection is the process of gathering and analyzing raw data or specific information to offer answers to relevant questions and ensuring the data quality is critical for data-driven decision-making (Rimando et al., 2015). It is also the gathering and measuring of systemic information from various sources in order to have an accurate view of an area of interest. Reliable and accurate data collection is essential to maintaining the integrity of research, making informed business decisions, ensuring quality assurance, and socioeconomic developments. Davis et al. (2019) designed the iCCM DQA Toolkit tailored for different data reporting system structures since integrated community case management (iCCM) programs data reporting tools and data flow vary significantly. The toolkit helps different countries reporting system to identify where data quality is compromised and reporting system areas requiring strengthening for informed adjustments to improve data quality, report strengthening, and inform decision-making. A reliable data collection and publicly available data are an excellent catalyst for democratic accountability. Reliability in data collection could allow citizens to hold governments to their commitments, enable governments and donors to allocate resources in a way to impact people's living conditions. It would allow citizens to see results of developments. Also, as opined by Haftu (2019), as access to mobile phones is improved,

this will play a critical role in reducing the citizens' poverty level by raising the per capita income of that region.

Reliable data and best practices for decision-makers is what the world and society need, especially in underserved areas of developing countries to reduce mortality in low-income countries. Nyangara, et al. (2018) assess data quality and reporting systems of the World Health Organization in supporting the rapid access expansion program carried out to implement iCCMin some States in Nigeria. Nyangara et al. (2018) stated that data availability, completeness, and consistency were good indicators of adequate data reporting systems and useful quality data. The bulk of the research on data collection is in qualitative studies where researchers examined the challenges and effects of reliable data collection.

Data changes so fast that it could become untimely and imprecise. These changes require higher requirements for processing technology and that reduction of potential error in data collection is minimized because of automated data entry. Human interaction is minimal with the use of RFID (Dogan et al., 2016). Data can be measured as a function of education, health, food, and others to identify the poor, using the criteria of the levels of consumption and expenditure. Reliable data, if not collected in real-time, could result in obtaining outdated and unreliable information as the use of this data during analysis could generate misleading conclusions, results, and eventually lead to decision-making mistakes by governments or other organizations (Cai & Zhu, 2015). Ekeu-wei (2018) emphasized that it is necessary to adopt new technologies for improved data collection, ensure sustainably, and improved hydrological data collection.

When IT managers and data collectors cannot collect the required reliable data in real-time or deal with data needs over a sustained period, it could result in obtaining outdated and unreliable information. The use of these data in the analysis could generate misleading conclusions and results and eventually lead to governments and other organizations (Cai & Zhu, 2015). At present, real-time data collection, processing, and analysis software for data is still in development or improvement phases. The Independent Expert Advisory Group on a data revolution sustainable development (2014) report stated that although there is progress in data collection, the omission of many persons occurs during the counting of the person in the community. This anomaly in data generated could lead to denying citizens their fundamental rights. Most often, data remain unused because they are not reliable and available when needed for decision-making.

When data are not reliable, it could hinder accurate decision-making in most institutions around the world. The government plays a significant role in providing the public with goods and services central to social stability and shared economic prosperity: security, health care, education, and more. These roles cannot be played expertly without the accurate necessary information. Essential births and deaths data, size of the labor force, and the number of children in school are fundamental to governments' ability to serve (WHO, 2015).

Weak data affect Africa's ability to make the right policies and decisions. Beguy (2016) calls on all African policymakers to use evidence-based research to inform development decisions. This research requires a rigorous collection of data with a coordinated system to disseminate data to advocate national policies to produce reliable

data systems. Quality data are vital for governments and institutions to provide accurate planning, funding, and evaluation of developmental activities (Beguy, 2016). No nation can build and enroll children in schools without knowing the number of children in a geographical location. Private investors are interested in knowing what resources are available before investing their money. A nation must know what it grows and how to prevent famine; all these can only be possible when there is reliable data (Beguy, 2016). When the data supply side is reliable, there is hope for decision-makers at all levels as there will be increasing demand for relevant information for policymaking and budgeting (Rimando et al., 2015). Sixty-five percent of the Sustainable development goals' (SDGs) in 2015 indicators in Central African countries were either estimated or derived from statistical models in 2010, indicating that data in Africa are not timely, frequently produced, not accurate, and of poor quality (Rimando et al., 2015). Beguy (2016) mentioned that over the years, it had been observed that Nigerian government decisions of the economy are based on data that were not credible, accurate, or timely.

Research shows that Nigerian data and the statistical system are weak, less than optimal, uncoordinated, and mostly ineffectual. It cannot meet standards of policymakers, business investors, and the citizens (Olubusoye et al., 2015). Users are motivated by these unsatisfied needs of data usage to ignore national data to make do with their own even though not scientific, uncoordinated, bias, and emotion driven. The desire of nations since the 21st century is on statistics and getting data right. In his speech at Chatham House, the Secretary-General of Nigeria Bureau of Statistics stated that data and information in our global age are continuously evolving in a significant manner in our

everyday lives. This role stems in business, health, housing, education, environment, policy, community, and politics. Data are vital as it provides nations with clear objectives and numerical evidence on every area of the citizens lives, including population, economic planning, decision-making, well-being, and state of the environment. Without reliable and accurate data, the government cannot make well-informed decisions that will affect socioeconomic development that will cause any generational change. Ananti et al. (2018) noted that until there are strategies to collect, store, analyze, and interpret data correctly for policy prescriptions and direction, the governments will not have a go-ahead with a clear vision to meet the real needs of its citizenry.

The demand for quality data is increasing, and the National Bureau of Statistics is growing to meet this national demand despite funding challenges (Olubusoye et al., 2015). Nigeria is still developing with building systems and institutions; therefore, the need for official data in the public sector is more efficient in providing accurate data. The role of statistics agencies and the government is to understand citizens' needs and policymakers to provide data that is most relevant. Olubusoye et al. (2015) also claimed that through increased collaboration, openness, and engagement with critical stakeholders, like government, agencies, organizations, academia, and the media, data collection managers can develop a reputable data collection strategy with high data quality. There are potential benefits when more data and reliable data weigh against the actual cost of providing statistics in administrative data (Sandefur & Glassman, 2015). According to Jerven (2015), when the UN High-Level Panel called for data revolution for the world's population to be counted, it was made clear in the instruction to

measured, weighed, and evaluated information must be put in a manner to inform policymakers and citizens usefully.

Impact of Technology on Reliable Data Collection Strategies

The increase in open data, big data, data governance, and the right data, has been the debate on whether African data are weak or whether there is a statistical challenge or renaissance in Africa. There is a global increase in attention to quality data. Data is used by governments, organizations, and civil society as a currency for accountability with technological advancements, which has enabled virtual data collection and increased feasibility and reliability of observing neighborhood health behavior and outcome disparities (Kepper et al., 2017). In like manner, the use of technology in the rapid collection and processing of data has helped in recent natural disasters. During Haiti's devastating earthquake in 2010, some researchers from the Karolinska Institute and Columbia University analyzed data from over 2 million mobile phones to detect population movements across Haiti. Analysis of data collected during the flood; relief materials were allocated efficiently because of the information handed over to the humanitarian agencies in Haiti (Reynolds, 2018). The examples from the impact of IT on reliable data collection provided high-value solutions for citizens in Haiti.

Redefining the concept of big data and reviewing its developmental impact on developing economy was Afful et al.'s (2018) study on the adoption of big data technology. The evolution of 'Big Data' has caused a real transformation in businesses, government, and other organizations. Africans are beginning to take an interest in the use

of technologies associated with Big Data, leveraging the enormous amount of data they generate. When collected data is analyzed correctly, it would provide the nations with wealth of knowledge for decision-making processes and develop strategies that will give competitive advantage.

According to WHO (2015), the experiences during the Ebola crises in some parts of Africa involved using technology in data collection to strengthen the workforce, build capacity, improve community engagement, and improve infection prevention control in a coordinated way. The health management information system was used as a significant platform for data collection. Ballio et al. (2015) used the RISPOSTA procedure to collect, store, and analyze high quality, consistent, and reliable data in the aftermath of floods. Ballio et al. (2015) argued that although there are perceived increases in the information collected during a flood with the use of technology, most data found gives a slim idea of the impact of the flood or to access what was the effect of the flood. The RISPOSTA procedure created by Ballio et al. addressed the need for standardized ways of flood data damage collection to produce consistent and reliable flood databases to meet the objectives of risk mitigation. Procedures to satisfy several data loss requirements include referring data to different exposed sectors to view the impact of flood, collecting data for proper scale analysis chosen by subsequent data aggregation, and collecting data at various times to determine the extent of the damage.

A methodology was proposed by Van and Curtis (2016) for use in areas where data collection and analysis take place while preserving scientific integrity. A robust data presentation technique was developed by Van and Curtis to deal with complexities

associated with different needs of multiple stakeholders, enabling results reviewed from various management perspectives and further analyses. Grimaccia and Naccarato (2020) discussed the impact of TQM on practices government performance to produce quality based on the experience of people in the quality and quantity of food. The food insecurity experience scale (FIES) is used to analyze food insecurity in both developed and developing countries. The study was to validate the FIES in assuring policymakers that the technology is needed to implement meaningful development in society.

Tscholl et al. (2016) explore the impact of online data collection versus paper/pencil data collection results. The result shows an increase in financial savings and access to the large population when data is collected online. Procedures to satisfy several data loss requirements include. Over the past years, computer-based data collection strategies and tools have increased rapidly as they progressively replace paper-and-pencil-based methods. Tscholl et al. (2016) opined that the manual process of validating electronic data is usually more complex than the traditional approach when compared. Thus, stakeholders should embrace computer-based data collection strategies in government and other organizations. Zygun et al. (2018) study, shows an approach to validating the use of data repositories in supporting regular and efficient use of high-quality secondary data in health care. Quality of data extracted from a clinical information system is used to improve quality and research with independent checks on quality as a critical part of any multipurpose emergency medical response (EMR) system.

Creating an efficient method for quality data collection and benchmark would help in determine objectives, formulating policies, and plans to achieve the goals of having accurate and reliable data for adequate resource sharing across Nigeria (Olanipekun et al., 2015). Resource allocation is essential as people, nations, technology, funds, existing resources, equipment are deployed and supplied for development. Grabowski et al. (2016) emphasized that resource allocation requires coordinated and synchronized data sources, reliable data collection, analytical tools, and methods for assessing data and identifying trends in support of real-time response or preparatory planning.

Transition and Summary

Section 1 was the introduction of my research study with a brief background of the study, problem statement, purpose statements, research questions, introduction to the conceptual framework used, review of the framework's professional and academic literature, and the topic of the study. I summarized reliable and quality data collection issues and challenges in sub-Saharan Africa. As a conceptual framework TQM sees quality as a culture that involves everyone for continuous improvement of both processes and products to improve quality. I defined the planned execution of the study in section two, including the target population and sampling method to select participants. I gave details of the research methodology and design used; how I will collect, organize, and analyze data; I also described the ethical, reliability, and validity considerations that I will implement in section 2.

Section 2: The Project

In this section, I discuss the data collection strategy and overall methodology for the project study. I draw connections with existing literature and the conceptual framework that anchored the study. The section begins with a restatement of the study purpose. Other sections are devoted to (a) the role of the researcher, (b) research participants, (c) research method and design, (d) population and sampling, (e) ethical research, (f) data collection instruments, (g) data collection techniques, (h) data organization techniques, and (i) validity and reliability of this study.

Purpose Statement

The purpose of this qualitative exploratory multiple case study was to explore strategies used by some IT managers in sub-Saharan African countries to ensure the reliability of data collection to meet economic planning and decision-making goals. The target population consisted of IT managers and data collectors in government establishments in Rivers State, Nigeria, who have strategies to ensure the reliability of data collection to meet economic planning and decision-making goals. This study may provide strategies that could be used by IT managers and data collectors to ensure the reliability of data collection in sub-Saharan African countries. Implications for positive social change include more accurate and reliable data collection strategies that may ensure appropriate budgeting and resource allocation to states and local governments areas, which may improve the living condition of the citizens.

Role of the Researcher

As a researcher, I was the primary data collection instrument in this study. The researcher is the principal in the data collection process in qualitative research (Sanjari et al., 2014). This role involves configuring the study, scheduling research participants' interviews, interpreting results, coding concepts and themes of collected data, and confirming findings (Sanjari et al., 2014). I did not have any relationship with potential participants. The relationship between the researcher and the potential participant could result in selection bias (MacDermid, 2017). I was familiar with this study's topic because of my experience as a senior management-level IT leader with experience in database management. To minimize the potential for bias, I conducted this doctoral study in my city but not in my backyard or at my immediate place of employment. For the integrity of data collection, backyard research is critically avoided. I also mitigated potential personal bias by writing memos and maintaining a reflective journal.

I collected data in a trustworthy manner to mitigate bias and to avoid bias on my part as the researcher. I wrote memos throughout the data collection and analysis and maintained a reflective journal on my techniques to reduce bias. According to Morse and Wilson (2016), to mitigate bias, researchers should identify bias and engage in bracketing or expose bias that cannot readily be eliminated. I had my opinions about what strategies IT managers are employing to ensure the reliability of data collection. However, to minimize bias, I bracketed my ideas and views, strictly followed the research protocol, question and did not inject my views and opinions to address this limitation. I adhered to interview protocols by obtaining proper approval to conduct interviews, maintaining

participant confidentiality, and implementing an alphabet and numeric coding system for data.

I used the interview protocol to post open-ended questions to all the research participants. As stated by Peters and Halcomb (2015), semistructured interviews allow researchers to develop predefined open-ended questions to generate productive participant responses that will increase the understanding of participants' experiences and views. Castillo-Montoya (2016) stated that using strong interview guidelines allows researchers to capture meaningful data based on the participant's experiences. I conducted interviews with the use of open-ended, semistructured questions. This approach allowed me to delve deeper into participants' responses to the questions. Also, I examined my interview notes to notate interview observations made. Video recordings improved data evaluation (Yates & Leggett, 2016). My notes contained assessments of issues raised during the open-ended interviews, which I used during coding and identification of themes. During the interviews, I was observant of the participants' responses and their difficulties as they reacted to the interview questions and knew when to ask probing or follow-up questions. Answers to these follow-up questions were helpful in explaining the participants' responses.

As the primary data collection instrument for this study, I observed and listened carefully to change or adjust paths during the interview processes. I followed my intuition to adhere to the interview protocol. According to Castillo-Montoya (2016), as with the change of paths during interviews, researchers should follow interview protocols and not deviate from them. Lastly, all interview protocols were followed while remaining

sensitive to any verbal and body cues from the research participants. In this qualitative multiple case study, I protected the rights of all research participants.

I protected participants's right by following the guidelines of the *Belmont Report*. The *Belmont Report*, which was released in 1979 by the National Commission for the Protection of Human Subjects in Biomedical and Behavioral Research, focuses on primarily three ethical principles that will be adhered to conducting research. The ethical principles include respect for individuals, beneficence, and justice, which encompassing allowing participants to freely decide if they want to participate in a research study (Miracle, 2016). I obtained voluntary participation in this study by informing the individuals of the right to participate in this research study. The *Belmont Report* is an ethical guide to safeguard the rights of those who are involved in a research study.

Beneficence consists of protecting research participants from harm (Miracle, 2016). I achieved beneficence by ensuring that all participants were aware of any possible harm that might occur in the study process by signing a consent form. I also obtained approval for my research from Walden University's Institutional Review Board (IRB). IRB's primary role was to examine the research standards, shield participants from hurt, and ensure minimal risk. I kept all participants' names anonymous to maintain confidentiality in this study during the interviews, and I sought to treat all participants equally without any discrimination. I conduct interview sessions with the use of an appropriate interview protocols that applied to each research participant.

I also mitigated bias with the use of the interview guidelines and the recording of interviews. According to Yates and Leggett (2016), a qualitative research study is

subjective, allowing the researchers to state their own bias concerning the research study. Researchers such as Thomas (2017) have argued that the validation done by research participants on recorded interviews improves the credibility of a study. I established methodological triangulation by editing and comparing feedback obtained from the research participants' documents to validate findings and minimize bias.

Participants

Participant selection is a challenge in research studies involving human subjects. My target population for this qualitative multiple case study came from three government ministries in Port Harcourt, Nigeria, with successful strategies on reliable data collection. Participants are selected before the collection of data (Marshall & Rossman, 2016). I selected potential participants based on the following criteria: (a) serving as a senior IT professional in government; (b) serving in roles such as chief information officer, senior data collector, chief programme analyst, IT director, or IT project manager; (c) working with the Rivers State government in Port Harcourt, Rivers State; and (d) having at least 3 years of IT work experience and having implemented a reliable data collection strategy. Only participants who are knowledgeable in the research topic facilitate the collection of in-depth information (Palinkas et al., 2015). I selected participants with a higher level of IT experience with appropriate qualifications to answer the interview questions.

The IRB is responsible for approving, monitoring, and reviewing behavioral research involving humans. Every step of the IRB process ensures the scientific quality of a study and the ethical conduct of the research team and the research participants (Dukes et al., 2015). I obtained permission from the Walden University IRB before commencing

data collection in this study. I gained access to eligible participants by phone or email, versus in-person means, because of the necessity of social distancing due to the COVID-19 pandemic.

When I will contacted participants via email or phone calls, I introduced myself, explained the purpose of the study, and requested that they sign a letter of consent. I obtained permission from the three government ministries to interview their employees for my research study based on the purposeful selection strategy that I developed. I sent emails to participants based on their meeting the criteria for my research study. I also informed them that participation in the study would be voluntary and that the decision to participate would not lead to any retaliation by their ministries. Individuals participate more often in a study when the research question seems relevant to their field of study and potentially helpful to their organizational policies (Cacari-Stone et al., 2014). After participants respond to the consent form via email, I began to schedule interviews. To ensure confidentiality, I allowed each participant to ask questions via email or telephone before starting the interview process. Haahr et al. (2014) stated that researchers and participants' communication during the interview process influence data collection. More interviews and follow-up questions were generated from the previous interview questions based on the responses of the participants.

Research Method and Design

The focus of this study was on exploring strategies used by IT managers to ensure reliable data collection for economic planning and adequate decision-making necessary to distribute and manage resources at various levels of government. The need for reliable

data collection is vital for accurate decision-making. However, research regarding the strategies to ensuring reliable data collection needed by IT managers and data collectors to be successful is not globally available (Danovaro-Holliday et al., 2018). To better understand the experiences of IT managers related to reliable data collection, I conducted a qualitative exploratory multiple case study.

Method

The most used methodologies are quantitative, qualitative, and mixed methods (McCusker & Gunaydin, 2015). According to Wells et al. (2015), the nature of research methodologies influences their use in research. The qualitative research method aligned with the exploration of the dynamics that relate to ensuring reliable data collection by IT managers. It allowed participants to express their perceptions of the phenomenon in their own experiences. The qualitative research method also enabled me to probe the research participants' experiences because I could, at least in the phone interviews, engage somewhat in participant-observation. Qualitative research answers questions about the "what," "why," or "how" of a phenomenon, not "how much" or "how many" (McCusker & Gunaydin, 2015). I chose the qualitative research method because I wanted to explore what strategies IT managers in government parastatals use to ensure data collection reliability.

The whole idea in this research method is to provide insight into what participants have experienced with the knowledge that qualitative researchers explore a person's behavior descriptively. The researcher collects data from the participant's viewpoint using qualitative research in semistructured interviews, observations, note-taking, and

conversations. All these attributes are the reason the qualitative research method is best for this study. My intent, however, was to explore strategies used by IT leaders to ensure reliable data collection in Rivers State, Nigeria. Thus, the qualitative research method alone is a sufficient method to complete in defining the purpose of this study. Neither a solely quantitative nor a mixed-method approach is appropriate for this study.

The quantitative research method uses numerical data to prove or disapprove a hypothesis and is approved for hypotheses testing through the measurement of specific variables (Barnham, 2016). The quantitative method uses surveys and quantification of data and findings (Tominc et al., 2018). The primary goal of this study is not to find the numerical measurement and analysis of study data. The qualitative approach explore the phenomenon through real-life experiences, not from a review of relationships between variables. The quantitative method will not be appropriate for this study because I will not use statistical analysis to accept or reject any hypothesis regarding relationships or differences in variables or explain the phenomenon.

The mixed-method research method was also considered for this study. Researchers use mixed-method research, which is a combination of both qualitative and quantitative methods. Cathala and Moorley (2018); Charman et al. (2015) stated that the mixed-methods method could be used when neither quantitative nor qualitative approach cannot answer the research questions in the study. I did not select the mixed method approach because it will consume the research timeframe when combining both methods and the qualitative method alone is sufficient to answer my research question.

The qualitative method is used instead of the mixed method or the quantitative method to understand the meaning behind actions and behaviors and to see the phenomenon from the participant's perspective (Van & Struwig). McCusker and Gunaydin (2015) stated that data collection increases due to the intense combination of both methods. In all, the qualitative method approach was used for this study because it addressed the intended focus of my research questions.

Research Design

The common designs in qualitative research methods are the case study design, phenomenology design, and the ethnography design. The exploratory multiple case study design is used for this study seeing the differences in both qualitative and quantitative research methods. According to Cronin (2013), the multiple case study design is optimal in approach to explore complex shared events in organizations. When the study focuses on a single individual, it is referred to as a single case, where the study uses more than one person, event, or entity; it is a multiple case study. Qualitative research case study facilitates the use of multiple data collection methods which may come from interviews, observations, note taking, and document reviews to facilitate an inductive approach of inquiry in gaining in-depth knowledge of the research phenomenon in their natural environment of the participants (Bristowe et al., 2015). This research focuses on exploring a phenomenon in multiple cases to develop an understanding of the case. This study replicates the same findings across several persons by exploring the differences and similarities between and within cases to create evidence that is considered robust and reliable.

The most suitable research when conducting evaluations is the case study research while studying the phenomenon in a natural setting or determining what happened or why it happened (Yin, 2013). This study approach provides an opportunity to explore the issues with the context of work, which was the intent of this study. Investigators get close to the individuals on interactions in day-to-day practice, which is one benefit of the case study. Therefore, case studies are common for research design in government (Yin, 2013). For this reason, I selected a case study design for this study.

The phenomenology design is suitable when the purpose of the study is to understand a lived-in experience but not the most appropriate design to explore a program such as strategies to ensure reliable data collection in a natural environment, which is the intent of this study. The phenomenological design has its roots in philosophy and psychology to understand the essence of a phenomenon. Individual experiences are explored by having the first-hand experience with the phenomenon (Errasti-Ibarrondo et al., 2018). The description of the researcher's phenomenon under study and how it is experienced is the significance of the phenomenon (Errasti-Ibarrondo et al., 2018). The phenomenological design is not appropriate for this study since the study seeks to explore strategies to ensure reliable data collection in a natural environment.

Ethnographic researchers pave into potential research participants to have a deeper understanding of the dynamics of the participants' lived-in experiences and perceptions in their social context (Marion et al., 2015). Ethnography research design is also described as the comprehensive evaluation of individuals routinely, which requires ongoing participant observation for data collection. This type of research design can be

time-consuming and expensive (Boddy, 2016). Since ethnography design is not concerned with a distinct culture or cultural group, nor did it focus on participants' cultural or social behaviors, it is therefore not appropriate for this research. I do not also intend to directly observe and study members of a cultural group over a specified time. I considered each qualitative design's appropriateness and found the case study design is the most appropriate for this study. The research focuses on exploring strategies used by IT managers to ensure reliable data collection for adequate planning and decision making goals and not investigate IT, managers, themselves, or their beliefs and behaviors.

The case study design allows researchers to deal with the topic of research in a naturalistic setting, allowing for consideration of the phenomenon in natural occurrences (Arseven, 2018). The exploration of every aspect of the phenomenon will necessitate data saturation achievement. Data saturation as a critical element in a qualitative case study design ensures research quality and validity (Fusch & Ness, 2015). Data saturation is achieved when an adequate amount of time is spent in the field, collecting data until the researcher finds no new data (Fusch & Ness, 2015). Data saturation occurs at the point when the diminishing return and the researcher no longer identify new themes or when any new data does not continue to address the research question, and other researchers can replicate the findings.

Lowe et al. (2018) also stated that data saturation is reached when collecting data fail to produce any discovery. To achieve data saturation using the case study design, the individual participant will be interviewed until no new data is collected. I ensured data

saturation by continuing the interview process until the research participants present no new information.

Population and Sampling

This study population consists of IT managers in government establishment in Rivers State, Nigeria, Port Harcourt. Small sample sizes are used for qualitative explorations than those used in quantitative studies. Qualitative research is mostly based on interviews exploring the participant's social life beyond appearance to manifest meanings.

Purposeful sampling is used in qualitative research because it generates information of the most significant utility to the study instead of relying on chance, which is what random sampling connotes (Palinkas et al., 2015). Purposeful sampling identifies and selects information-rich cases for effective use of limited resources to identify and select individuals or groups of persons who are well experienced with the phenomenon of interest (Palinkas et al., 2015). Due to the number of cases and participants in this study, it is appropriate to use the purposeful sampling technique. The target population is the entire set of subjects that can inform the research (Martínez-Mesa et al., 2016). The researcher immersed in this research field establishes continuous relationships with respondents to address the depth of the research problem using a small number of cases to facilitate the researcher's close relationship with participants and enhance the validity of fine-grained, in-depth inquiry in a naturalistic manner.

Purposeful sampling could be used in qualitative research for rich information cases with limited resources (Palinkas et al., 2015). Fusch and Ness (2015) noted

determining an adequate sample size has a direct relation with data saturation. I selected a sample of at least four IT managers at each site to explore strategies they used to ensure reliable data collection, which includes the positions of managers, directors, assistant directors, chief information officers, senior and senior project managers from three ministries in government establishment in Rivers State. Four participants were selected per each case. Eligible participants must meet criteria before inclusion in this study: The participants must hold a senior IT management position in any of the two ministries in the State with supervisory responsibility for at least three years and must have strategies in reliable data collection. IT managers and senior data collectors who did not meet these criteria were not eligible for this study. The signed consent form was the media used to ensure that all participants meet these requirements. I selected participants through purposeful sampling. The more information produced by a participant for relevant research, fewer participants would be needed for the study (Malterud et al., 2016). The appropriate sample size is adequate to address the research question but not too large that the amount of data disallows in-depth analyses. Patton (2015) opined the use of five to 10 participants as sufficient when carrying out a qualitative study since larger samples do not allow for an in-depth investigation of the phenomenon of interest. The use of a purposive sampling technique, as recommended by Palinkas et al. (2015), was appropriate for the limited number of cases and participants in this study. A researcher's work attains data saturation when no new data is collected, no new themes emerge, and there is enough information to replicate the study. Saturation might be achieved within the initial six interviews (Fusch & Ness, 2015). Overall, the research justifies a small

sample size of participants for this study. Data saturation is the concept in which further data collection does not add any new information to the data obtained already (Wells et al., 2015). Data saturation is the point at which collecting more data will not yield new discoveries in the research (Lowe et al., 2018). I interviewed a minimum of 4 individual participants per each case until I reach data saturation.

The interview setting offered a comfortable and nonthreatening environment, enabling participants to be open and honest about their personal experiences. The background should be free of bystanders and others that may pose a threat to data quality (Lau et al., 2017). I held interviews at the participants' convenience and did not conduct face-to-face interviews at public places such as open offices. I conducted interviews via Skype or any other video conferencing platform or phone given with the COVID-19 pandemic, eliminating the researcher or participant's requirement to travel. I scheduled interviews for 60 minutes or more.

Ethical Research

The section discusses measures to assure the participants' ethical protection is adequate, ensuring the informed consent process, participants' withdrawal from the study procedures, and incentivizing the participating process are clearly defined in this study. Whenever research involves interactions with human subjects, there must be ethical considerations to handle. Ethical research practice involves acquiring informed consent and voluntary participation of potential participants (Eisenhauer et al., 2019). For this study, contacts were made to the IT Managers of the participating organizations to obtain consent from their organizations to participate in the study and to interview participants

during the process of data gathering. The process to obtain informed consent, as stated by Biros (2018), for research participation, ensures the ethical rights of any potential research applicants. Forster and Borasky (2018) discuss the principles of respect for persons and states that researchers consider the individual's right in order to determine the state of participation. I described the research study and data collection process to the participants. Thereafter, participants were requested to confirm their agreement to participate by replying with signed informed consent via email.

I adhered to the *Belmont Report* requirements to consider an individual's right to decide whether to participate. Complete compliance were put in place with the Walden University IRB guidelines. I commenced interaction with participants only when I obtained approval from the IRB to begin data collection. At the point of recruitment of participants, it was made clear that participation is voluntary with consent forms signed by all participants before participating in the study is considered as informed consent. Participants gave their informed consent acknowledging that they are aware of the social and physical risks involved in the study (Eisenhauer et al., 2019). For this study, participants' level of involvement, rights, and the possible uses of the research outcomes were made known to all participants. Approval to conduct the study is only by the IRB with confirmed consent, including factors of participant's discretion to withdraw from the study at any time (Yip et al., 2016). Standard ethics and behavior were the main criteria to deal with participants in this study. The main central research concerns in ensuring data integrity, participant's protection, and research confidentiality are ethical considerations (Duong, 2015). (Dikko, 2016) declare that the informed consent process is

a measure to ensure that all participants' rights are not violated. I informed all participants before the interview that participation is 100% voluntary in this study and withdraw from this study is without any consequences at any time.

Participants in this study did not benefit from any incentives, either financial or compensational, for participating. According to Giles et al. (2016), financial or compensational incentives in qualitative research can influence participants' behavior in the study. The participants' informed consent was increased by making sure there is transparency in dealing with potential participants to avoid any forms of deceit or misrepresentations and maintain confidentiality. I requested for demographic data only, such as age, educational level, sex, job description, from the participants in a respectful manner. Participant's name, religion, place of birth, ethnicity, and family background was not needed for this research study. Participants' identities will be kept as private during coding to protect participants' privacy during data collection and analysis stages.

The participants were made clear with the informed consent process and method of study, risks involved and potential benefit, confidentiality, and risks of withdrawal and rights to obtain study results. Participants were allowed to withdraw from the study anytime via any mode of communication if they choose to withdraw. All information received from the participants during the study after the withdrawals were destroyed immediately. One researcher's ethics is to respect an individual's opinion, judgment, and actions (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979; Yip et al., 2016). According to Yip et al. (2016), the researcher's primary duty is to protect all participants' privacy and confidentiality. I

maintained the confidentiality of the participants by ensuring that all identifiable information related to the participants, such as name, organization, and specific job role and title were from the study. All references to participants were coded with either alphabets or numbers.

Data collected from the interview will be stored in password-protected digital files for at least five years of restrictions placed on the physical security of the devices. After five years, I will destroy all data collection and delete all saved electronic data to prevent access and retrieval.

Data Collection

Instruments

As the researcher for this study, I was the primary data collection instrument. One of the data collection methods is the researcher himself or herself (Wa-Mbaleka, 2020). Upon getting approval from the Walden University IRB committee to conduct this study, I contacted and informed IT managers in the three ministries of government organizations who are potential participants through email, given the prevailing circumstance of COVID-19 pandemic. Elo et al. (2014) define data collection as the systematic process idea gathering on a study's concept, meaning, and definitions of a phenomenon. The qualitative research uses interviews, focus groups, note-taking, observations, and document analysis as common data collection methods (Sutton & Austin, 2015). In this study, I used interviews, note-taking, and observation as my data collection methods. Data were collected from multiple sources with semistructured interviews on Skype or other audio-conferencing options; According to Ridder (2017), the in-depth

semistructured interview is used to collect qualitative data to achieve a holistic understanding of the research question. The semistructured open-ended interview gives a deeper understanding of the subject matter. According to Sutton and Austin (2015), interviews allow participants to unveil deep insights into a research topic. O'Keeffe et al. (2016) stated that the semistructured interview discusses a particular topic guiding the interview process. I choose the semistructured interviews for my study because this method of the interview majored in a specific topic to guide the interview process.

This interview also guided the conversation in a standardized manner that is relevant, thereby allowing participants to give up more detailed information pertinent to the study (Kallio et al., 2016). According to O'Keeffe et al. (2016), research shows that an interview with open-ended questions helped avoid unresponsiveness during the interview process and minimizes bias. Interviews with Skype or other audio conferencing options was the most important source of my data in this case study research with a semistructured interview with open-ended questions as recommended by Ridder (2017). I informed study participants via email about the phenomenon of study, and they provided me with additional documents where necessary.

I used an interview protocol (Appendix A) with semistructured open-ended questions to collect data for this study. Morse (2015) defined semistructured interviews as a predetermined set of questions followed by sub questions. I constructed the interview questions as open-ended and sub-questions to inform my research question. Abdalla et al. (2018) stated that triangulation, member checking, and prolonged engagement in achieving saturation in qualitative research establishes credibility. Ridder (2017) opined

that data collection is based on triangulation, combined with interviews, documents, and observations. I used member checking, transcript review, observation, and triangulation to deal with research reliability and validity. Member checking is used in qualitative research study to ensure credibility and validity as a means of achieving saturation by giving participants the ability to read the researcher's interpretations and provide corrections or additional information (Nowell et al., 2017). The researcher and participant work together with the use of member checking to prevent bias, thereby adding validity to the data collection process (Thomas, 2017). At the end of the interviews and after the researchers' analysis, I scheduled a session to follow-up with each participant for member checking and took copies of the transcription and evaluation report to the follow-up interview for review with the participants. Allowing each participant to confirm, expatriate, or correct all the information they have provided as they feel necessary until the participant responses gave no new data. During the interviews, I took note of the participants' discussions and the general context as field notes using as specified protocol.

Triangulation is how researchers explore different levels and perspectives of the same phenomenon (Fusch & Ness, 2015). Oliveira et al. (2018) defined data triangulation to include the use of multiple sources of data to develop findings. Data triangulation was implemented by Lopes and de Carvalho (2018) to gain an in-depth understanding of their study's research methods. Data triangulation facilitates comparison of the collected information and ensures the credibility of the study findings with a deeper understanding of the research phenomenon (Fusch & Ness, 2015; Morse, 2015). To achieve

triangulation, I gathered data from multiple sources from more than one person or time to develop my findings in this study. Researchers use interviews and organizational documents related to their research questions to gather information for analysis (Marshall & Rossman, 2016). I used semistructured interviews, document review, company archival documents, and reflective notetaking for my data collection. I asked the selected organizations for their documents for data collection. I selected and interviewed participants of organizations with information of their archival records and artifacts.

Data Collection Technique

On receipt of IRB approval and organizational agreement to participate in data collection, I used the corporate information systems to generate the list of potential participant names and contact information. Interview data for this study were collected using an interview protocol (see Appendix B). According to Wood et al. (2016), the interview protocol guides the researcher in conducting professional interviews.

The sessions were recorded using Skype or other audio conferencing options for subsequent transcription and evaluation. I also collected recorded open-ended interview data from telephone or Skype professionally with an interview protocol. I forgo the face-to-face interview as a data collection method given the COVID-19 pandemic. The use of the phone for conducting interviews is becoming more popular in data collection. Zhang et al. (2017) state the benefits of phone interviews for data collection. Sipes et al. (2019) identified that Skype could be an effective method for collecting detailed information from potential participants. I used the phone, Skype and other audio-conferencing options

to conduct my interviews to obtain detailed information from participants and a means of keeping physical or social distancing due to COVID-19 pandemic.

The advantage of using phone, Skype, or other video conferencing techniques for data collection is to get detailed information and to probe for clarity during the interview sessions. Brown and Danaher (2019) gave a guiding framework to maximize the ethical and methodological advantages of semistructured interviews. The advantage of using the semistructured interview for qualitative research is to probe for clarity and attentive listening while conducting open-ended interviews. The other advantage of using the semistructured interview as a data collection technique is concentrating on the case study as opined by Bowden and Galindo-Gonzalez (2015). Lastly, Seitz (2016) emphasized that the advantage of the researcher conducting a semistructured interview is used to gain the opportunity to observe nonverbal communication. Thus, I conducted this study interviews using semistructured open-ended questions to keep nonverbal communication with my data collection techniques (see Appendix C).

Any data collection technique used could also have a disadvantage. Baskarada (2014) observed that researcher bias and data collected during interviews could be misrepresented and potentially distort the study's results. It is, therefore, critical to ensure that bias does not affect data collection processes. To mitigate the potential distortion of results in this study, I ensured to avoid bias when interviewing participants to prevent misrepresentation of participants' responses from getting an accurate result in my research.

Conducting member checking during each interview ensured the reliability and validity of data collection (Marshall & Rossman, 2016). Member checking sessions was provided for participants to confirm my analysis and comment with any corrections or additional information the interviewee may have. To conclude the interview sessions, a follow-up session was scheduled with the participants for member checking where a copy of my transcription and evaluation report was taken for a follow-up interview to review the evaluation report. I repeated member checking until no new information was found. This also yielded data saturation. Records from the phone and audio of the follow-up sessions are made. A copy of the updated transcriptions is kept with the research data following the data retention policy described in the consent form.

Data Organization Techniques

The use of specific practices is necessary for data organization in a qualitative case study due to the amount of information and evidence collected during the study and organization of data. In a qualitative research study, researchers collect rich, in-depth data to answer the research questions and ensure validity and reliability in a study (McCusker & Gunaydin, 2015). Also, a researcher uses research notes, research logs, and interview transcriptions to expose themes and patterns (Wardale et al., 2015). I conducted semistructured interviews for my research study and review organizational documents related to my research question. As stated by Marshall and Rossman (2016), researchers use semistructured interviews to allow flexibility for the participants to respond to the interview questions. I did not schedule face-to-face interviews with participants on an agreed-upon audio conferencing platform like Skype or phone discussions owing to the

COVID-19 pandemic, date, and time. I selected virtual meeting medium that allow effective interviews with minimal distractions.

Researchers use an interview protocol to maintain structure during the interview process (Castillo-Montoya, 2016). I used the interview protocol as a guide to explore strategies used by some IT managers in government in Rivers State, Nigeria, to ensure collection of reliable data to meet economic planning and adequate decision-making goals (see Appendix A). I took notes of all responses that are important during the interviews and that would be beneficial to common themes and triangulation of participants' responses. Semistructured interviews, artifacts, and organizational documents are the data collection instruments I used for this research study.

As the researcher, I used a research database to improve my research reliability as a chain of evidence was be provided with a log on where and when the data was collected. I also used member checking to allow the participants interpreted the summary I made from their interview responses to validate my interpretation. The goal of using member checking is to check for accuracy and capture the participant's thoughts accurately while ensuring I reach data saturation. A catalog of all data that was collected during the study was stored in a computer-aided qualitative data analysis software tool (Nvivo 12). All physical artifacts are locked in file storage for review and retrieval for five years. All participants' information, like addresses, emails, and phone numbers, are logged to track appointment dates and any related changes and kept in a digital file and backed-up in the cloud with other research documents.

Data Analysis Technique

Most researchers collect data from multiple sources of evidence to engage in methodological triangulation in conducting a qualitative case study. Qualitative data analysis in case study design is carried out when a researcher uses rich data extracted from the raw data with analytical tools and techniques to produce rich, credible, and reliable data for study (McCusker & Gunaydin, 2015). The purpose of data analysis is to find meaning within the data collected relevant to the research questions and purpose of the study (Bengtsson, 2016). For this study's purpose, the researcher will identify meaningful data to draw a realistic conclusion to the research question.

Researchers adopt several methods of data analysis strategies in qualitative research to achieve research integrity. The use of memos, procedures categorizing such as coding and thematic analysis, and strategy connections such as narrative analysis are some of the methods used by researchers. A researcher using a qualitative case study focuses on the phenomenon in its natural environment (Arseven, 2018; Popescul & Jitaru, 2017). I used an option that best fit the available data to answer my research questions.

Coding is used by researchers to categorize words and phrases with similar meaning to the research questions as categorization strategy (Van, & Curtis, 2016). Van and Struwig (2017) argued that codes are used to capture words and phrases with the same meaning with the use of categories to connect them. I adopted the descriptive coding method as my basic analytical technique for this study. This coding method was used to symbolically assign meanings to segments of data to provide an inventory of words or phrases to index and categorize my data. Consistency is key in the processes

that were used for data collection, recording, and analysis on all cases to provide an enabling platform for the synthesis of data. Wood et al. (2016) stated that NVivo is a data analysis program that is effective for most qualitative research designs. The use of NVivo will be appropriate for developing codes and themes for my case study and conducting data analysis.

Data collection from an interview is a primary data source in qualitative case study (Thomas, 2015). I used the semistructured interviews with open-ended questions with the interview protocol in Appendix A to collect data from research participants. Although various techniques for conducting the analysis in qualitative case study, the common technique includes constructing the volume of data collected to identify codes and themes to facilitate interpretation and understanding of the participants' views and experiences (Bengtsson, 2016). Boblin et al. (2013) among other authors recommend triangulation during analysis to add credibility to qualitative research and facilitate analysis of complex data collected via different methods from multiple sources.

Methodological triangulation, as described by Patton (2015) is the process of analyzing data collected through different methods for consistency of findings. I collected data from different participants using multiple methods including interviewing and document review being attentive to the triangulation of data during analysis. Houghton et al. (2013) opined that triangulation in case study research analysis contributes to the rigor and credibility of qualitative research design. Methodological triangulation uses multiple methods to analyze and correlate data collected from numerous sources (Fusch & Ness, 2015; Hussein, 2015). During the data analysis process, I used the methodological

triangulation to compare and contrast interview data with documentation data in this qualitative study to improve the credibility of the findings. I continued interviewing participants until no new data is found. I used the CAQDAS program to support data analysis with NVivo. The CAQDAS was used to search the main body of data for keywords and phrases to generate manual codes to ensure that no essential segments of data are ignored in the analytical reflections and compilation of emerging themes and concepts.

Reliability and Validity

Qualitative research measures rigor based on credibility, dependability, conformability, and transferability (Hadi & José Closs, 2016). In qualitative research, the researcher seeks dependability, credibility, and conformability of the findings to allow future researchers to have confidence in the finding regarding transferability to other cases or settings.

Reliability

The reliability of a study is a measure of how well the study could be repeated with relatively the same outcome (Cypress, 2017; Pompei, 2015). According to Cypress (2017), reliability refers to the idea that the study's findings are replicated when the same objective methods are used. The more the findings can be replicated, the more reliable is the study. According to Fusch and Ness (2015), the objective of reliability in research is to minimization errors and biases. To apply reliability in my research, I used clear and straightforward protocols, transparent processes by clearly describing all data collection and analysis instruments and techniques. I presented all my findings concisely and

unbiased, respecting all participants and ensuring their confidentiality. Researchers achieve the reliability of their research data through data saturation (Fusch & Ness, 2015; Zakrison et al., 2015). Data saturation is achieved when research no longer provides new information, and the researcher has enough information that he/she can replicate it (Boddy, 2016; Zakrison et al., 2015). The use of open-ended questions could enhance the reliability of the research data. Open-ended questions enable participants to provide in-depth answers to questions, thereby avoiding participant bias and improving the credibility and reliability of the data (Nagasaka et al., 2016). I interviewed at least 4 participants per case and continue to gather more information until no new information emerge through the interview process to answer my research questions to accomplish data saturation.

Validity

Validity is a measure of how well the research studies capture what was intended. A research validity is also relevant to how both those in the inside and outside of the research community perceive the study. Participants in study research are more likely when the study is logical, where the purpose of the study is well understood (Korstjens & Moser, 2018). In this study, I ensured that data collection instruments and procedures are clearly explained while remaining consistent throughout my study. Member-checking is served as a validation step to make sure the researcher captures and interprets the information for the intended purpose of study (Birt et al., 2016). To ensure validation, I utilized a member-checking method to allow me to validate collected interview data with other authors' data. According to Birt et al. (2016) the use of member checking will allow

participants to provide a final review, elaborate, edit, and confirm the interview data collected and how it will improve the accuracy of the interview data. The methodological triangulation collects data from multiple sources to enhance validity, also to compare and contrast the data diversity (Morse & Wilson, 2016). Using a multiple case study research design for this study allows different types of government ministries with IT managers to participate in the semistructured interview process to contribute to my research data. I achieved data triangulation using the different types of participants who will offer numerous viewpoints to facilitate my research data's reliability and validity. Multiple perspectives of these participants from three different government parastatals will reduce participant bias.

For this qualitative multiple case research study, I seek reliability, validity, and trustworthiness with four components: dependability, credibility, conformability, and transferability.

Dependability

In a qualitative study, researchers when conducting research, describe dependability as the stability of the data and the findings (Bengtsson, 2016). According to Forero et al. (2018) repeatability and consistency of research are determined by dependability. Researchers in ensuring dependability use strict interview protocols to ensure that the collection process of interview data is consistent by engaging participants in member checking in order to validate the interpretation of the researcher's accuracy for data saturation to be reached (Morse & Wilson, 2016). Detailed explanation of the steps taken during the research study to achieve study dependability will be provided to allow

other researchers to replicate the study (Moon et al., 2016). An audit trail that contains complete, detailed notes of the thought process and decision-making that influenced the research (Korstjens & Moser, 2018) is also necessary. Dependability adds reliability and validity to the study, so if the paths are the same and lead to the same results, the study is said to be dependable (Forero et al., 2018).

A study is said to be dependable in qualitative research if the same or similar methods and processes are repeatable to reach the same conclusion through member checking, transcript review, and pilot testing (Forero et al., 2018). Nowell et al. (2017) opined those themes, descriptions, and viewpoint are directly developed from data while confirming that each is in line with participants' thoughts and the information, they convey through member checking. In order to increase the dependability of the study, I conducted member checking. I also left a detailed audit trail that discussed the study's methods and processes, which lead to my findings to establish dependability.

Credibility

In qualitative research, credibility in qualitative research is when participants' viewpoints align with the researcher's representation of those viewpoints (Korstjens & Moser, 2018). The credibility of the research study reflects the researcher's accuracy in reporting the research study's data. Bengtsson (2016) stated that the researcher must establish confidence in the research findings. Several techniques can be used to determine the credibility of a study, include member checking, data triangulation, and prolonged observations (Korstjens & Moser, 2018). Through data collection, the credibility of an investigation could be influenced by a researcher (Korstjens & Moser, 2018). The

researcher's approach to data collection can determine if the researcher's representation of the data aligns with the participant's viewpoints. Moon et al. (2016) noted that researchers ensure credibility by collecting reliable data, using a strict interview protocol, engaging participants in member checking, and accurately interpreting and reporting the findings.

The collection of data from multiple sources and the use of methodological triangulation in conducting a qualitative study improve the credibility of the findings (Morse & Wilson, 2016). After conducting interviews, I spent a day or two listening to the audio recordings carefully, transcribing each word, and understanding participants' responses. Follow-up schedules on a phone call or emails will be made to initiate the member checking process. As soon as I identified and documented themes and content, I continued to collect data until the themes and content were reoccurring till no new information appeared. The member checking process was used to confirm my understanding or correct my misunderstanding of the collected data based on the responses I gathered from the phone calls made. My viewpoint was concluded to represent the participants' thoughts, opinions, understanding, and feelings in order to encourage participants to evaluate the information for consistency, alignment, and truth. I took part in qualitative inquiry until the participants agree that I have a complete understanding of their viewpoints. This ensured the credibility of my data.

Confirmability

In qualitative research, the researcher's confirmability is increased when participants provide additional details or explanations during data collection in the

semistructured interviews and with member checking for the researcher's interpretations to establish validation by the participants (Moon et al., 2016). The use of multiple sources of evidence for data improves the confirmability of the findings using triangulation to compare data diversity (Morse & Wilson, 2016). Forero et al., 2018; Nowell et al., 2017 stated that confirmability is the notion that the others in the research community would corroborate or support the research. Triangulation, member checking, repeatability, alignment, and generalizability are input into confirmability. Components of dependability, credibility, and transferability are all confirmability requirements. The researcher addresses the validity and reliability of the research to coagulate the study in credibility and integrity. Research has confirmability when the researcher conducts a study with findings derived directly from the data. In this study, I accomplished confirmability by documenting and providing rich details in the form of notes, descriptions, thoughts, and decisions with the help of the participants.

Transferability

Transferability of research, as referred by Forero et al. (2018), is to the degree to which the research is generalized or transferred to outside of which it was intended. Research is said to be transferable when it can be used in other contexts or environments. Transferability requires that the researcher demonstrate the study's meaning to the participants and non-participants to show the finding of the research study on other research settings (Moon et al., 2016). Transferability requires that the researcher demonstrates the meaning of the study to the participants and non-participants to show the finding of the research study on other research settings (Moon et al., 2016). To

achieve transferability, the results must have meaning to individuals who are not within the context of this study (Forero et al., 2018; Korstjens & Moser, 2018). I provided detailed descriptions of all processes, methods, and actions taken for this research were provided, data collection method and research protocol were also presented in detail to provide insight into my thought process and decision-making. Finally, I gave details on the results of the study. The information gave the study transparency and accessibility. This information provided other researchers with a path to reproduce this study if the research is transferable to their environment and context.

Transition and Summary

Section 2 contained the proposed plan for methods and processes in my research study. Research study components of this section include the role of the researcher, participants, research method and design, population and sampling, data collection, organization, and analysis. Quality research is ethically sound with protection of participants. Finally, in this section, I provided information on the data organization and the analysis processes and procedures to ensure reliability and validity of the research. In Section 3, I included the research findings based on the analysis of my data, the application of the research findings to professional practice, and the implications for social change. In addition, Section 3 contains recommendations for action, recommendations for further research, and reflections and conclusion.

Section 3: Application to Professional Practice and Implications for Change

Overview of Study

The purpose of this qualitative multiple case study was to explore strategies used by some IT managers in sub-Saharan African countries to ensure the reliability of data collection to meet economic planning and decision-making goals. I interviewed 12 participants from three government parastatals who had experience in ensuring reliable data collection. The participants were IT managers with more than 3 years of working experience in their ministries who were responsible for ensuring reliable data collection. Due to the COVID-19 pandemic, data collection for this study took place over the phone or using audio conferencing software rather than in person. I also reviewed pertinent documents from the institutions involved in the research to understand the strategies used by some IT managers to ensure reliable data collection. The collection and analysis of the organization documents provided data triangulation that supported the information gathered during the interviews. I performed member checking with all 12 participants to confirm their interview responses.

In this section, I present the outcomes of the analysis. In addition, I discuss the implications for professional practice and positive social change and provide recommendations for future research and action. Data analysis resulted in the following five strategies to ensure reliable data collection: (a) data quality assessment, (b) education and training, (c) management and employee involvement, (d) use of technology, and (e) advocacy and sensitization.

Presentation of the Findings

The research question that underpinned this study and served as the basis for my interviews was, What strategies do some IT managers in sub-Saharan African countries use to ensure the reliability of data collection to meet economic planning and decision-making goals? I used methodological triangulation to analyze the data from semistructured interviews with follow-up, member checking interviews; phone calls; and a review of organizational documents. Five main themes emerged from analysis of the data collected through interviews with 12 participants from the three participating government parastatals and the review of six documents provided by the participants.

I replaced the names of participants and participating organizations with coded pseudonyms for anonymity. The codes of PxOy and OxDy were used to identify the participants and participating organizations and their documents, with P = participant, O = participating organization, D = document, and x and y = integers indicating the interview order. Each theme's frequency is presented in tables as it occurs, and the count represents the number of documents and participants supporting each theme.

Theme 1: Data Quality Assessment

The first major theme to emerge from the data collection was the need for a DQA. The use of DQA affords developing countries the opportunity to collect reliable information about organization data. DQA provides a data quality profile and allows users to collect information on organization data to evaluate data quality characteristics with accuracy, consistency, and data timeliness on reports (Yourkavitch et al., 2018). Informed decision-making, planning, implementation, performance evaluation, outcomes,

and interventions require high-quality data and practical DQA. Seven participants from the three participating organizations highlighted the importance of DQA to measure their data quality. Quality data assessment starts with the data capture phase of each source to understanding the data. Table 2 shows the frequency of DQA as the major theme.

Table 2

Frequency of Data Quality Assessment Theme

Major theme	Participants		Documents	
	Count	References	Count	References
Data quality assessment	12	103	6	87

Participants' responses indicated that DQA is an effective strategy for ensuring the reliability of collected data. Data quality is crucial for decision-making and economic planning. P2O₁ explained that DQA is done twice a month to identify poor and vulnerable citizens in a community. This routine review of data quality is built into a system of checks in the organization's information and management system as part of a feedback cycle to identify and correct any error that may have occurred during data collection in real-time. P2O₂ said, "Data collected is submitted online daily from the field by data collectors, downloaded to be cleaned, and analyzed twice a week for each month by the program analyst." Most DQA processes include data collection supervision, data validation, data cleaning, data harmonization, data verification, data scanning, and data migration. P3O₁ responded, "One of the strategies we use to ensure reliable data collection include integrated supportive supervision and conducting DQA, with the use of a predefined checklist, data harmonization, and data validation."

Participants P₁O₂, P₁O₁, and P₂O₃ supported that DQA ensured data collection reliability and shared their methods for employing DQA for the reliable collection of data. P₁O₂ responded,

One strategy we use to ensure reliable data collection is to assess data quality by comparing data received from the ministries with the staff raw data during biometrics. The staff confirms their data records by signing into their portal to verify that the record migrated to the new database of the ministry is correct compared to their data.

P₁O₁ responded, “I make sure data collected from the field by any data collection personnel with the use of the Birth 1 (B1) form are later checked and validated with the use of the predefined checklist before issuing a birth certificate.” P₂O₃ stated,

As the state health information officer, I collect generated data from each healthcare facility and compare with all facilities in each Local Government Area with the use of a checklist. We use this strategy to detect errors in captured data and correct during data harmonization.

Like P₁O₁, P₃O₃ explained that DQA is implemented in their organization to verify the source, quantity, and impact of data items that could breach predefined data quality rules. P₁P₄ further explained that the DQA task is executed by collecting data from various data collectors from the field and checked using a predefined checklist for verification. In addition, P₃O₄ said that his organization’s DQA process contains different data quality parameters to test data quality and ascertain the reliability of collected data to

determine whether they meet the quality required for projects. Participant responses show that the theme of DQA is vital to ensure and maintain reliability in data collection.

Multiple quality assurance checks are instituted with several supportive supervision rounds, data collection tools, and monitoring by both federal and state data collection managers. P₂O₁ confirmed that the ministry employs a DQA strategy using the Kobo toolbox to collect and identify the poor and vulnerable data in a community. The KoBo Toolbox is an open-source tool for mobile data collection which allows users to collect data in the field with the use of mobile devices such as mobile phones, tablets also with paper or computer. Using the kobo toolbox with a predefined checklist is passed through the proxy mean test to determine poor and vulnerable data. The ministry uses these strategies and data tools to collect, prepare, clean, and analyze data more effectively.

Two organization documents mentioned the use of DQA to ensure reliable data collection. O₁D₁ stated,

The CSPro program on the supervisors' netbooks also accessed data quality through field check tables generated concurrently with fieldwork. In addition, the CSPro also accessed inserted translations from field interviews of data collected. Field check tables generated by the CSPro program on the supervisors' netbooks check various data quality parameters to access data quality.

The archival document from Organization 2 also established the implementation of DQA using the CAPI. The document stated that data collected from the field, after translation to the three central Nigeria languages of Igbo, Yoruba, and Hausa, are inserted into a

software application to enable field-based capture of the verbal and social autopsy study interview data on a computer. O₁D₂ further established that the biomarker paper questionnaires should be compared with electronic data files to check for any inconsistencies in data entry.

The participants' responses and organizational data show that several mechanisms are used by both state and federal authorities to measure the quality of data during DQA to ensure the reliability of data collection. Existing scholarly literature and data from methodological triangulation provided support on the use of DQA as a strategy to ensure data collection reliability. For example, Gürdür et al. (2021) stated that DQA includes profiling data sources to understand the general condition of the data and visually inspecting the records using a predefined checklist to identify each attribute present in each source. For data to be reliable, there is a need to consider errors, inconsistencies, misspellings in data entry, missing information, invalid data, or falsification. O'Hagan et al. (2017) and Yourkavitch et al. (2018) found that DQA provides a data quality profile that allows users to collect information on organizational data to evaluate data quality characteristics and data timeliness accurately. Reliable data, therefore, require accessing accurate and consistent data, combining different representations of data, and eliminating duplicate information.

DQA stimulates improvements to management information systems (Dahlggaard-Park et al., 2018). The current study participants' responses aligned with the findings of Yourkavitch et al. (2018) in that the government's collection of high-quality, reliable data should inform decision-making, planning, and correct implementation to evaluate

performance and outcomes as a culture. O'Hagan et al. (2017) and Gürdür et al. (2021) found that assessing the quality of data after collection and capture is beneficial to improving quality reliability for future use. Findings from the document review in the current study aligned with participants' statements that DQA is a vital step in ensuring data quality in an organization.

The DQA theme aligns with the study's conceptual framework of TQM. DQA aligns with TQM's approach to quality to enhance the use of quality data in the management system to analyze and measure system improvement. Organizations use TQM as a quality improvement concept to improve data quality (Olkiewicz, 2018). Deming (1985) defined TQM as a set of strategies to reduce or eliminate variations from production processes or service delivery systems to improve efficiency, reliability, and quality. Leaders use TQM to conceptualize an organization's integrated systemic strategy to improve product and service quality (Suryanarayana et al., 2015). The TQM framework supports the use of DQA as a strategy to ensure the reliability of data collection. According to Alnuaimi and Yaakub (2020), the TQM framework is usually considered a tool for accomplishing quality in organizational infrastructure to achieve and improve continuous products and processes. Therefore, the employment of this framework could enhance quality data collection processes.

Organizations rely more on data analysis to achieve a competitive advantage with quality data to create real value using several methods and techniques for DQA to identify relevant data (Ardagna et al., 2018). Poor data quality reduces customer satisfaction, leading to poor decision-making with negative impacts on strategic planning.

According to Aljumaili et al. (2018), to improve data quality and evaluate the data status, data quality needs to be measured. Shankaranarayanan and Blake (2017) stated that effective implementation of quality measures and accurate data must be obtained promptly to check required data quality performance measures.

I considered TDQM and ISO 9000 as theories for this study. They could have served to inform at least one component of the theme of DQA. Several modern processes and frameworks for continuous improvement of quality initiatives are based on TQM principles (Hohan et al., 2015). TDQM theory provides a methodology to ensure data quality through DQA. The TDQM methodology uses a version that directs data quality in defining, measuring, analyzing, and improving data. According to Barata and Cunha (2015), TQM implementation in ISO 9000 is necessary for DQA. Topalović (2015) stated that quality must prove international standards in the user's eye, and ISO 9000 certification as a model establishes that proof. Barata and Cunha, along with Joyce (2015), support ISO 9000 as a set of international standards for quality management and assurance and saw it as a blueprint to implement system quality. Both TDQM and ISO 9000 have qualities that align with TQM's analysis.

The data triangulation of the interviews, member checking, and document review validated the importance of DQA as a top strategy in all participating organizations to ensure data collection reliability. I found alignment in both current and existing literature, further validating the DQA theme. Finally, the TQM framework also supports and establishes the use of DQA.

Theme 2: Education and Training

The next theme to emerge during data analysis was the need for education and training to ensure the reliability of data collection. Employees must be educated and trained on data collection processes to ensure reliable data collection in any organization. Furthermore, informants, or those from whom data are collected, should be educated on the need and benefit of the information retrieved from them. Table 3 highlights the number and frequency of education and training as the second theme.

Table 3

Frequency of Education and Training Theme

Major theme	Participants		Documents	
	Count	References	Count	References
Education and training	12	98	6	62

The data collected in this study support that government and organizations must engage in the adequate education and training of personnel to ensure reliable data collection. The participants discussed the need to educate and train staff on data collection processes in terms of personnel and technical resources. IT managers and data collection officers without the requisite skills and professionalism may not collect reliable data effectively. All 12 participants from the three participating organizations agreed that education and training is a strategy used to ensure the reliability of data collection in their various organizations (see Table 2). P₁O₃ responded, “The ministry educates and trains data collection managers and data collectors on data collection processes to ensure quality data collection before sending them to the field.” P₃O₁ stated,

“As an IT manager, I educate, train, and supervise data collectors assigned to various local government areas on my watch for data collection, harmonization, and validation in the ministry to ensure the reliability of data collection.”

Adequate education, training, and retraining must exist to ensure reliable data collection for decision making and planning goals. Showing the importance of education and training in their organizations, P₃O₂ stated, “We train data collectors to allow them to be part of the development team from the start so that they can be aware of the data tools necessary for data collection.” P₄O₃ responded, “Education and training processes develop the data collectors on the data quality policies, what the policies say, and how to follow the data quality policies.” P₁O₂'s response indicated the impact of education and training in their organization, “Education and training sensitize employees and keep them abreast with current data quality policies, guidelines, tools, and educate them on the proper and acceptable quality data collection attitude and culture.” P₂O₁ responded,

My role in managing and implementing some strategies is to make sure the data collectors are well trained and retrained on how to input data in the predefined forms using the checklist and how to respond to questions to get accurate information from informants.

P₁O₃ explained, “If employees do not know the processes of reliable data collection, they will be blind to understanding why they need to ensure collection of reliable quality data in the ministry.” P₁O₃ continued, saying “Sometimes data collectors, after training, still get the wrong ideas on data collection processes, midway in the field they do the wrong things especially when they do not understand the questions posed in the questionnaires.”

The participants shared their methods for educating and training employees. P₁O₃ said, "The commission utilizes induction programs, seminars, e-learning, and Zoom to educate staff on quality data collection processes and policies." P₂O₁'s organization utilizes lectures, seminars, tests and pretests, and training programs organized by senior management staff to educate their data collectors on quality data collection processes and policies as well as the need for education and training to the states' citizens. P₃O₃ stated, "The commission conducts data collection awareness and training using online, computer-based, training courses." P₂O₁ responded,

As an IT manager, I educate and train data collectors in conference halls with the use of projectors and tablets in various LGAs. During the COVID-19 pandemic, I use the video and audio-conferencing media to train and retrain data collectors from all the LGAs and used hands-on practical exercises for the training with series of tests and examinations to choose the best candidates before sending to the field.

P₃O₂ responded, "We organize pieces of training for data collectors in the government ICT training center with the use of desktops and projectors."

Training sections are lead and designed by the ministry's lead IT manager using online training sites to train their employees. The results from the interviews and member checking of all participants confirmed and supported education and training as a theme. One of the participants suggested that data collection should be in the curriculum in the country's learning institutions like data management and informatics to train learners for data collection.

I also analyzed bulletins, fact sheets, and other documents from the study organizations. The materials I reviewed established the use of education and training on measures to prepare data collectors, so they were versed with questionnaires, procedures, and policies to ensure reliable data for planning and decision making in the state. Documents from the participating organizations also support the education and training theme. All six documents reviewed validated the education and training theme, which enhances the theme's reliability and validity.

The six documents reviewed included information on data collection, data surveys, data collection strategies, and processes. The documents on data collection revealed the need for data collection in the state and nation, why accurate data collection is important, employee's data collection responsibilities, and government responsibilities on data collection. The data survey documents contain detailed information and processes of the 2020 Nigerian education data survey to evaluate better education service delivery for all operations. The data collection strategy and process document provided details on the process, tools, and techniques used to achieve reliable data collection in the states with the objective of accurate data use.

Current scholarly literature also aligns with the participants' responses regarding the need for education and training as a theme. According to Kinyondo et al. (2019), the problems of data collection precision could be solved by adequate training of data collectors on the use of modern devices. Kinyondo et al. further recommended increasing the accuracy of the collected data and analysis to ensure the best possible interpretation for accurate decision-making and planning results. Chukwu and Mbaeri (2017) stated that

it was challenging to collect energy data in Nigeria due to a lack of expertise. According to Shonhadji (2017), employees gain competence, expand their knowledge, and change their behavior through education and learning. These findings in the literature show that the education and training theme, in the form of continuous improvement, articulates change as a concept in the aspect of the organization to encourage employees to meet strategic goals set by stakeholders.

According to Waqanimaravu and Arasanmi (2020), training is a process where people achieve a certain ability to help achieve organizational goals. Various corporate objectives bind this process. In their study, Waqanimaravu and Arasanmi focused on the relationship between employee training and service quality, testing the impacts and benefits of perceived access to employee training. Other researchers have showed that organizational training affects employee work performance and culture. Abdullah (2020) stated that some important reasons for training include newly recruited employees who sometimes do not understand the organization's processes correctly and could cause increased competitiveness to improve productivity.

The mediating role of education and training has increased KM in the recent era. KM as a tool is seen for competitive advantage to increase quality. Effective use of KM mediates the efforts for quality improvement, thus improves organizational performance (Shujahat et al., 2019). The increase in education and training has also knowledge sharing, developing, capturing of stakeholders and employees for practical use in the organization (Davenport et al.,1998). Most government and other organizations focus on developing new KM concepts among employees with overall strategies to improve

organization performance (Yusr et al., 2017). Some studies describe KM as a continuous process of knowledge creation.

The TQM framework is further used to discuss the need for education and training to ensure reliable data collection in this study. The continuous improvement process is implemented as a TQM framework in most organizations to improve product or service quality. IT managers also use the Baldrige Excellence Framework as a conceptual framework to study organizational operations to provide service quality through continuous improvement (Pimentel & Major, 2016). TQM and organizational learning are interrelated concepts because they focus on continuous improvement and competition (Olkiewicz, 2018). Tscholl et al. (2016) explores the impact of online data collection versus paper/pencil data collection results.

The theme of education and training aligns with the TQM the conceptual framework for this study. On-the-job training is one of Deming's prescribed 14 points that serve as guidelines for organizational behavior and TQM practices. The Deming postulated plan-do-check-act or PDCA cycle which led to performance excellence in organizations, improve data quality through standardized employee education and training with its critical points (Zimmnicki, 2015).

Crosby's TQM theory based on four absolutes of quality management define quality as adherence to requirements. The theory establishes that prevention is the best way to ensure quality with zero defects being the performance standard for quality and the price of nonconformity measures quality. Crosby's lists of fourteen steps to quality improvement include appropriate education and training of leaders to ensure that

employees and stakeholders learn the steps to quality. Pambreni et al. (2019) agree with Crosby's theory stating that the influence of TQM will elevate quality and improve business performance in the service industry with the implementation of one of its critical elements of education and training. TQM practices of continuous education and training have a positive effect on employees' work-related attitudes. Research results from Karia and Asaari (2006) indicate that training and education could positively affect organizational commitment.

Viewing education and training themes with the TQM perspective makes it imperative to improve employee performance as a system's output. The TQM theories earlier mentioned expand the theme and its alignment with TQM. The use of the TQM concept provides an opportunity to employ the theme of education and training in reliable data collection. TQM as a fundamental framework helps speculate how education and training might further enhance capabilities in data collection environments. IT managers in most organizations seek ways to improve data quality by using the TQM framework as a quality improvement and training concept.

Theme 3: Use of Technology

The use of technology to ensure the reliability of data collection was the third theme to emerge during the data analysis of this study. All 12 participants discussed the need to use technology to improve reliable data collection in the State with changing and evolving technologies. Table 4 illustrates the number of references to the theme.

Table 4*Frequency of the Use of Technology Theme*

Major theme	Participants		Documents	
	Count	References	Count	References
Use of technology	12	80	6	54

Organizational use of technology in the data is an essential factor to ensure data collection reliability for decision making. All 12 participants made references to the use of technology during their interviews. Participants responded to how technological devices like laptops and phones enhance their organizational controls to ensure reliable data collection and data quality. P₁O₁ stated, "The provision of new digital data collection equipment and tools in the commission by the government has improved the collection of geographical data." The use of technology has resulted to automation of most survey data thereby reducing processing time, increase data quality, accuracy, and reduces work stress". P₂O₂, P₄O₁, and P₁O₂ all mentioned the importance of using technology in reliable data collection to improve data quality. P₂O₂ responded, "The use of technology has enabled the State government through my department to build simple data collation protocols in the databank by integrating all State data.

P₁O₂ also iterated that "we input raw data into the computer system for cleaning, data harmonization, and data verification to ensure reliable data collection for decision-making, which makes the data collection process very fast". Three participants complained about the inadequate use of technology in their organizations, resulting in some setbacks during data collection especially in the hard-to-reach terrain, P₃O₁ stated,

One setback in ensuring reliable data collection in the state especially in difficult terrain is the inadequate use of modern technology. Hence, the government should provide more computers and mobile data collection mediums to meet with technological trends.

Five participants stated the importance of using technology in their organization during data collection process. To affirm the need for the benefit of technology in their organizations, P₂O₃ said, "Currently, the Ministry has put in place an automated or computerized system of data collection with the use of the computer-aided personal interviewing (CAPI) tool." P₁O₃ stated the improvement of data quality with the use of technology in their organization, because of the establishment of the state-of-the-art data bank with good computing facilities to store captured data, retrieve, and conduct data analysis to ensure the use of accurate data for decision making in the State.

Participants P₂O₁, P₄O₁ and P₃O₃ further confirmed the importance of using technology for accurate decision-making in data collection. P₂O₁ stated, "With the use of technology, the ICT department with the governor's directive has automated all ministries, parastatals, and other departments in the civil service and State so that processes will become digital and less stressful". P₄O₁ responded, "I make sure the data collected is accurate by cleaning the data with the use of the checklist on my computer". Participants also stated that their organizations often use automated and virtual data collection systems to collate and monitor citizens' data and employees' activities. P₃O₃ stated, "We use online video conferencing and phones to collect data especially in hard-to-reach terrains during communal clashes." P₃O₃ further stated that their organization

employed the use of virtual mediums and the open data kit (ODK) phones programmed for the collection of data during emergency cases and hard to reach terrains; like in the riverine areas to collect data from healthcare facilities in the state. Two participants also mentioned that their organizations still use paper and pen during data collection process. P₄O₂ mentioned “we still use the manual method of data collection with paper and pen”. P₂O₁ said “The computers provided by the commission are not yet fully in use as most of the equipment are not yet installed in the offices, so we are still using the manual method of data collection”.

Responses from participants and archival documents show that the use of technology in reliable data collection could increase quality and productivity. P₃O₁ also mentioned that the lack of adequate technological facilities and tools is a hindrance to ensuring the reliability of data collection while the manual process of data collection slows the reporting process and results in inaccuracy that may occur due to human error and fatigue.

The findings from the interviews and member checking of participants supported the use of the technology theme for this study. The theme of using technology to ensure the reliability of data collection is widely represented in current literature.

Computer-based data collection strategies and tools have progressively replaced the paper-and-pencil-based methods. Some participants in this study responded that though the electronic data collection method seems intricate, it has increased quality and production. As opined by Tscholl et al. (2016), the manual process of validating

electronic data is usually more complex than the traditional approach when compare. This statement is confirmed by P₃O₁'s statement presented during the interview.

Nevertheless, government and other organizations should embrace computer-based data collection strategies. Zygun et al.'s (2018) study shows an approach to validating the use of data repositories in supporting regular and efficient use of high-quality secondary data in health care. The ease of wireless technology in a secure manner could allow IT managers and data collectors to ensure the reliability of data collection. As continuous and reliable data collection remains a major challenge in the medical field, Miro et al. (2019) mentioned the need to use of technology in remote continuous data collection using wearable.

Collecting data in hard-to-reach areas and conflict zones can be extremely challenging, but it is necessary to capture all citizens to measure horizontal inequalities. To capture accurate citizens' data in hard-to-reach terrains require the use of innovative technologies. Technology is a valuable tool to access data from remote and conflict-affected areas where exclusion is likely to be the worst. As the world has become increasingly digital, technology has permeated our daily lives. Given this, technology is now playing a pivotal role in areas such as data collection or conflict prevention (Ting et al., 2020). There are several valuable data collection methods currently available to organizations and governments. The social media monitor extracts information from social media networks such as Twitter, Instagram, Facebook, Google Plus, and others (Ting et al.). Technology is also changing the way people respond to crisis. Following the 2010 Haiti earthquake, thousands of people volunteered online to support rescue

operations for the first time. That response gave birth to the Digital Humanitarians project, which, through crowdsourcing, created a digital crisis map that showed the real-time evolution of the situation in Haiti (Reynolds, 2018). According to Ting et al., Digital technology can enhance reliable data collection in hard-to-reach areas. Governments and organizations often use automated and virtual data collection systems to collate and monitor citizens' data and employees' activities. The government in Singapore partnered with WhatsApp (owned by Facebook) to allow the public to gain access to accurate information about COVID-19 and government initiatives (Flowerday & Tuyikeze, 2016).

Documents from the participating organizations also support the use of the technology theme. Out of the six documents reviewed, four of them validated the use of the technology theme, as seen in Table 4. The documents were used to achieve triangulation, enhance the use of technology theme's reliability and validity. The four documents include documents from the participating organizations on data collection processes, technology infrastructure and management, fact sheets, bulletins. The documents on data collection processes revealed how technology was used in data collection. The document on technology infrastructure revealed certain infrastructure provided by the government and organizations to enhance reliable data collection and management. Both the fact sheets and bulletins highlighted how the use of technology in data collection increases data quality and data governance and the need for the use of modern technological tools and equipment.

Focusing on the use of technology aligns with the selected conceptual framework. The forefathers of TQM did not integrate technology and TQM in determining quality,

but there is a co-alignment between TQM and technology in predicting quality with innovation (Prajogo & Amrik, 2006). In other words, the use of technology is an appropriate theme in harmony with TQM to enhance reliability in data collection, particularly quality. The gurus of TQM also advocate the need for continuous training to advance employee skills to ensure practical quality tools and practices for reliable data collection. The development of technology and innovation are the reasons for global competition in our world today (Krammer, 2017).

Theme 4: Management and Employee Involvement

The next theme to emerge in this study was management and employee involvement. Findings from the interviews and member checking of participants supported the management and employee involvement theme. This theme indicates that organizations must consider management and employee involvement to achieve reliable data collection. The top management in government or organization must be involved in the enforcement of data collection processes and policies for reliable data collection to be successful. Often, employees may not comply with data collection policies except when there is an executive order. Hence, employees should also be involved in decisions regarding their job schedules in data collection. The top-down management approach plays a crucial role in the enforcement of reliable data collection. All three organizations' participants asserted that management and employee involvement is one strategy employed to ensure the reliability of data collection. (see Table 5).

Table 5*Frequency of Management and Employee Involvement Theme*

Major theme	Participants		Documents	
	Count	References	Count	References
Management and employee involvement	12	68	6	51

The data supports that management and employee involvement must exist to ensure reliability in data collection. Participants commented on the need for the involvement of both stakeholders and employees in organizational processes to ensure the reliability of data collected in their organizations. Eight participants across all three cases responded on the need to have both management and employees' buy-in and involvement in data collection processes to ensure reliable data is collected for decision making and planning. When asked about management and employee involvement, three participants stated that management and employee involvement in the data collection process is key to reliable data collection. P₂O₃ stated, "Most directors of each ministry are willing to buy into the new system and are ready to talk with their staff on the new data collection processes." P₂O₁ said, "Both the directors and data collectors should be involved in collecting accurate data and ensure reliable data collection process is achieved." P₄O₂ also iterated that "both management and employees engage in publicizing and sensitizing citizens on the need to provide accurate information to the data collector." Participants also stated that the organization's success in quality data collection is positively related to continuous management and employee involvement.

Increase in management and employee involvement would result in improved performance of employees and subsequently the organization. In agreement with Melnyk et al. (2013) study, P₄O₁ stated that “Sometimes data collectors after training still get the wrong ideas causing a setback is the application already developed.” O₁P₁ confirmed P₄O₁’s response stating, “The field functionaries like the data collector may not carry out their duties as assigned due lack of motivation from stakeholders.”

Responding to the importance to the theme of management and employee involvement, P₁O₃ responded saying, “One of the main concerns in achieving reliable data collection in our ministry is the need to allow IT managers and data collectors be part of data collection processes and decision making for quick response.” Although extensive literature exists on the management and employee involvement theme, the data triangulation of the participant’s interviews validated the importance of the theme as a strategy in ensuring reliable data collection.

Documents from the participating organizations also support the use of the management and employee involvement theme. Out of the six documents reviewed, three of them validated the use of the technology theme, as seen in Table 4. The documents were used to achieve triangulation. The documents include documents from the participating organizations on data collection processes, statistical bulletins, and social autopsy study. The documents on data collection processes revealed how involvement of management and employee is key to achieving reliable data. The statistical bulletins highlighted the involvement of management and employee in the collection of accurate and timely data to health indicators of its citizens for investments and to measure

progress. The document on social autopsy study discussed how management and employee involvement enhanced reliable data collection government.

Current scholarly literature also supports the management and employee involvement theme to ensure the reliability of data collection. Training of employees for continuous improvement could lead to employee involvement and participation. Marcel (2021) stated that training as a continuous improvement method is positively related to employee involvement. Douglas, (2006) said that whenever employees are involved in the organizational decision-making process, it makes them have a sense of value and purpose. According to Omar (2017), quality is a culture composed of the constant drive to quality, training, leadership, teamwork, and involving everyone in the organization's policy. Employee involvement results in and improves innovative employee behaviors (Brodtkorb et al., 2019). However, Jafri et al. (2016) argued that employee behaviors drift on the perceived corporate support and that climate and culture impact employee creativity, collaboration, and employee motivation. Organizations structured hierarchically with a transparent chain of command and team feedback culture encourage innovation and creativity (Sanner & Bunderson, 2018). Brodtkorb et al. further iterated that employee involvement in decision-making actively creates, shapes, and alters their working ethics. Employees are likely to have an open attitude towards learning, error correction, and seeing themselves as failures and opportunities for learning and further improvements and innovation.

According to Caniëls et al. (2017), management and employee involvement will enhance more proactivity and continuous seeking for opportunities to improve, revise

work processes, and seek innovative solutions to more complex work problems. In addition, when employees are involved in organizational operations, they feel safe and trust their leaders to support and reward them for creative initiatives. Employees will only share their faults, learning from failures, and seek feedback when they know that the organization will support their learning process (Department of Management & University of Bologna, 2016). Lleo et al. (2017) and Costa et al. (2019) opined iterated that management and employee involvement is strongly related to the success of continuous improvement in any organization.

Management and employee involvement are key to continuous data quality improvement (Bakotić and Rogošić 2017). Employees feel equipped with the relevant information, skills, and competencies when promoted or appreciated. Employees' increase their levels of engagement and involvement when they know they will be promoted on a regular basis for a job well-done. This enables them to be continuously engaged. Lartey, (2021) argued that performance management could adversely impact on employees 'performance if there is a misalignment between what the organization want to achieve and that of the employee. Performance management is a continuous process to identify, measure, and develop employee performance and align the performance with the strategic goals of the organization (Lartey, 2021). Employees, when engaged, feel empowered and become more involved in the organization. According to Marcel (2021), creating an infrastructure to train employees on various levels and empower them in a reliable data collection process will lead to a more successful quality data collection for decision-making and economic planning. It is also clear from the current literature and

the participant's response that management and employee involvement mediates the impact of training on continuous improvement.

Deming (1982) believed that quality improvement could only happen if the top management and employees' involvement is considered with significant organizational changes to achieve quality goods and services. TQM gives voice to the people and enhances their morale to meet obligations. TQM philosophy in the organization provides a significant advantage to the employees. One of TQM's critical points includes synergizing both employees and stakeholders in the organization. According to Olkiewicz (2018), IT managers in most organizations seek ways to improve data quality by using TQM as a quality improvement concept with one of its five-point agenda in management and employee involvement.

The forefathers of quality all believed that successful quality management requires senior management commitment with everyone's involvement in the organization (Arshad et al., 2016). TQM is a management approach to an organization, centers on quality, based on all members' involvement, and aims for long-term success and benefits to all organization members. In Juran's Quality Handbook, Sixth Edition (2010), Juran identified that TQM is a three-part process with staff at different levels making a unique contribution to quality improvement. The stakeholders have a strategic view of the organization, senior IT managers have an operational idea of the organization's quality, and employees have responsibility for quality control (Danuri et al., 2021). This theory supports existing research results with participants' responses showing that the TQM program had a positive indirect effect on the achievement of

reliability of data collection as output provided by the participating organizations. The literature reviewed shows that the theme of management and employee involvement in reliable data collection is significant to run in an organization to ensure the reliability of data collection.

The participants interview, member checking, TQM, and document review aligns with the management and employee involvement theme as a strategy to ensure reliable data collection in government and other organizations.

Theme 5: Advocacy and Sensitization

Advocacy and sensitization theme emerged as the fifth theme from the case study of the three organizations. This theme indicates that there must be advocacy and sensitization of respondents in government and organization before enforcing data collection. Stakeholders and IT managers of government and organizations must advocate and sensitize respondents on data collection needs, benefits, and processes for successful data collection. Everyone must be interested in this venture to achieve success; hence, stakeholders and employees must implement adequate data collection processes. The findings from the interviews and member checking of participants supported the Advocacy and sensitization theme. All three organizations' participants asserted that advocacy and sensitization are methods they utilize to enforce reliable data collection. (see Table 6).

Seven participants explained that their ministries use advocacy and sensitization to enforce reliable data collection compliance from the three organizations. For example, P₁O₁ explained that their management uses advocacy and sensitization strategy to compel

citizens to present accurate information. Similarly, P₄O₂ explained some respondents fail to give accurate information due to a lack of trust on previous data not used for adequate decision-making and resources allocations.

Table 6

Frequency of Advocacy and Sensitization Theme

Major theme	Participants		Documents	
	Count	References	Count	References
Advocacy and sensitization	12	61	6	31

The data supports that the theme of advocacy and sensitization in data collection is vital to improve data quality and ensure data collection reliability. In response to the strategies used to ensure reliability in data collection in their organizations, P₁O₃ responded, "citizens are also sensitized on the need to provide accurate information and the benefit of the collection of reliable data with the use of advocacy. This strategy encourages citizens to provide accurate data to government officials willingly". P₃O₁ responded, "We visit communities early to educate citizens of the need to register their births, deaths, and immunize their loved ones using town criers to pass information to the communities. Education and sensitization are needed to encourage citizens participate in data collection exercises in the state. P₄O₃ responded,

The citizens are also sensitized on the need to give accurate information to data collectors likewise advocate to the community leaders and village heads to educate their communities on the importance and benefits of providing accurate information to government officials during data collection.

The provision of accurate data by respondents during data collection will enhance economic and social growth in the community with precise decision-making and planning. P₃O₃ stated, "One strategy used to ensure the reliability of data collection is community mop-up as a form of advocacy and sensitization, where community leaders and chiefs assemble the community with the use of town criers to inform them of an upcoming data collection exercise. Also, visits to schools, churches, mosques and other places in the community are carried out to sensitize members of a community to register the births and deaths of their loved ones".

Participants further stated that without advocacy and sensitization of respondents in communities during data collection, they could not collect reliable data. Some persons give inaccurate information to data collectors for security reasons and the feeling that data provided over the years did not have any social and economic impact on the community. P₄O₁ stated, "Government should educate citizens on the need to collect reliable data. They should also advocate informing communities of the relevance of data collection". P₃O₃ iterated, "The ministry sends data collectors on sensitization exercise and advocacies to communities before the actual data collection process."

Participants acknowledged that intense efforts in sensitizing the public to a better understanding of the benefits of accurate data collection increase economic planning and decision making in the community. P₂O₁ stated that the council chairperson, chiefs, and community leaders are engaged to sensitize and publicize the need and benefits for presenting accurate information to the data collector to the community before commencing data collection exercise. However, P₁O₃ iterated that sometimes the

respondents lack an understanding of the purpose of data collection. Therefore, data collectors go from house to house to educate community members and sensitize them, and does advocacy to encourage members of the community to visit any data collection center.

To enable citizens to understand the importance of data collection and accurate data, some organizations undertake advocacy and sensitization programs before embarking on the actual data collection exercise. P₄O₃ stated, "My organizations use the advocacy and sensitization theme to ensure that citizens of the community understand the purpose of reliable data collection." The theme is well represented in the current literature. Data collectors advocate for citizens' availability and retrieval of accurate information to provide reliable data during the data collection process. While moving toward data integrity, collecting reliable data from respondents for precise decision-making and planning is vital for economic and social growth.

Organization documents O₁D₂ and O₃D₁ discuss advocacy and sensitization as a critical strategy in data collection to ensure reliability. The need for adequate sensitization and advocacies is necessary to enlighten respondents or informants on the benefit of providing accurate personal data for decision-making and economic planning. The theme aligns with existing literature, which supports the use of advocacy and sensitization strategy to ensure reliability in data collection. The potential for unethical collection and uses of data, if not proactively addressed, could upset economic and social balance (McGraw & Mandl, 2021).

The theme aligns with TQM, the conceptual framework for this study. A key tenant for TQM is the shift in responsibility for quality from stakeholders to all, believing that quality is a culture composed of the constant drive to involving everyone (Omar, 2017). Partnering relationship with citizens on quality data collection process can improve data quality. TQM focuses on the role of citizens in the public and private sector organizations while considering the positions of the citizens (Nour, 2018). TQM applies to any organization, whether private or public, irrespective of its size and motives. They are fast in adopting the ideology to make them effective in meeting public demands (ISO 9001). Different groups of people have other interests in government and organization programs. Thus, the application of TQM is quite critical for quality data collection with the use of advocacy and sensitization as a strategy.

The participants' responses and the evidence from the organization's archival documents align with the TQM concept, which seeks to identify with the wholeness of scientific and social problems on quality data collection (Bridgen, 2017). Reliable data collection is a scientific and social challenge, which can be handled effectively by incorporating advocacy and sensitization of citizens in a community. In addition, reliable data collection is a consistent process related to constant quality improvement with everyone responsible for success as a concept of TQM.

A TQM principle of effective communication is one of the generally accepted points. Effective communication can mean an open dialogue with citizens throughout the state on the importance of providing quality data with stakeholders to ensure reliable data collection. One of Deming's 14 Points principles for quality management is breaking-

down barriers. Advocacy and sensitization could break communication and insecurity barriers to providing accurate data by respondents during data collection processes.

Applications to Professional Practice

The perceived lack of strategies used by some IT managers in government organizations in Rivers State, Nigeria, to ensure the reliability in data collection for decision making and adequate planning goals was the basis for this study. However, the three organizations that participated in this research incorporated the strategies they used to ensure reliability in data collection. The findings from participant's interview, organization documents, the outcome of the conceptual framework's analysis, and the scholarly literature review contribute to discussing the strategies used by some IT managers in Rivers State to ensure reliability of data collection.

Based on this research study's outcome, my findings illustrate that government and other organizations could effectively employ five practical strategies to ensure the reliability of data collection for decision making and adequate planning. The effective strategies include (a) data quality assessment, (b) education and training, (c) use of technology, (d) management and employee involvement, and (e) sensitization and advocacy to ensure the collection of reliable data. IT managers and data collectors in different sectors of the economy could use this research's findings as a guide to enforce reliable data collection policies and processes in government and other organizations.

The participating organizations' strategies in ensuring the reliability of data collection align with the TQM framework. The participants in the participating organizations also demonstrated a positive attitude to behavior in complying with their

organizational data collection policies and procedures. In applying TQM theory to quality, stakeholders in organizations across various sectors understand their employees' involvement in data collection processes to ensure reliable data collection. In other words, management support influences the employees' participation to ensure quality and reliable data collection compliance process. Based on this study's result, it is evident that aligning organizational quality data collection policies with global data quality standards like ISO 9000 series and best practices will enhance reliability in data collection and improve data quality.

Government and other organizations could also align with best practices by having DQA using modern technology software and equipment, engaging in advocacy and sensitization of citizens using adverts, publicity, town hall meetings, and education. The participants explained how they ensure that respondents, those from whom data is to be collected in any community in each local government area, were first informed, sensitized, and educated on the benefit of data collection for decision making and planning to improve their living condition. In each participating organization, education and training enable the employees to see the need to comply with the data collection policies and align them to their responsibilities. Study documents and the participant's response showed and discussed how the use of education and training programs and management support strategy ensured the reliability of data collection. Reliable data collection processes also improve with the use of technology. In other words, the use of technology enhances reliable data collection by using best practice data collection

software and tools. Cuganesan et al. (2018) stated that the use of technology improves data collection.

Similarly, Jalali et al. (2020) explained that technology positively impacts data quality compliance. Responses from participants, organizational documents, and current literature indicate that technology helps ensure reliable data collection. When management and employees understand the use of technology and are careful with or mindful about the quality of data to collect, reliability of the data is imminent.

The findings from the research show the strategies used by the participating organizations to ensure reliability in data collection with the use of the TQM framework as a lens. This research could assist IT, managers, government, and other organizations by offering those strategies for reliable data collection to overcome reliable data collection challenges. The study's findings may also support reliable data collection policy implementation across various industries and sectors of the economy.

Implications for Social Change

The implications for positive social change of this research lie in the strength that this study's findings may significantly positively impact the public in reliable data collection. Unreliable data usually have a significant influence on decision-making and economic planning. When there is no integrity in the data collected, it could impact economic development. IT managers could implement reliable data collection strategies by utilizing the findings in this study. Assuring the citizens of the safety of their personal information, the confidentiality of their data, integrity of their data, and the use of their data for adequate planning and decision-making goals could enhance public confidence.

This study's findings may also benefit the public by providing information regarding how accurate and reliable data can contribute to economic and social development, aid resources sharing to improve citizens' living conditions and other benefits associated with the use of reliable data. These research findings may reduce the challenges of the collection of unreliable, inaccurate public and organization data. The results from this study would increase public confidence with the appropriate protection and privacy in using citizens' data to better their lives and influence economic and social development.

This study's findings may also contribute to the existing reliability of data collection knowledge by providing information on data collection policy and implementation. Similarly, the conclusions of this study could be a great resource to schools, learning centers, degree students who may take an interest in learning about reliability in data collection to develop and improve their knowledge, skills, and abilities or do more research in the field. The study's findings may also benefit private and public organizations and institutions in various sectors of the economy and countries by providing proven international best-practice reliability in data collection strategies. The findings from this study could also help upcoming IT managers and data collectors who wish to enforce reliable data collection policies in their organizations and require a detailed understanding of the challenges and strategies of implementing reliable data collection and how to handle related issues. This study's findings could also benefit the government and other organizations that wish to ensure reliability in data collection and implement reliable data collection strategies to improve their data quality.

Recommendations for Action

The use of this study's results as major strategies to ensure reliability of data collection could be employed by IT managers and data collectors who do not have the experience and knowledge to ensure reliability of data collection. Government and organizations could implement this result from this study for reliable data collection. IT managers could integrate the findings of this study into the data collection strategies in their organizations. IT managers and stakeholders should understand their employees' human behavior and strive to develop a positive organizational data collection culture that promotes reliability in data collection and a positive employee behavior attitude towards their data collection policies and procedures.

Reliable data collection processes should be designed to ease employee data collection strategies to achieve data integrity. Furthermore, IT managers should integrate dedicated data collection training and retraining programs as a critical aspect of their organizational data collection policy. The stakeholders and IT managers should partner with the management to conduct continuous tests to understand employees' personality behavioral traits and provide appropriate training for each category of employees before sending them to the field for data collection. The government and executive management should support reliable data collection by providing adequate infrastructure and tools for data collection and provide sufficient security during data collection, especially in challenging terrains. Government and stakeholders should eliminate the use of paper and pen or manual system of data collection and employ modern technology to improve reliable data collection. It will be challenging for employees to comply with reliable data

collection policies, embrace reliable data collection culture, or risk collecting data in a hard-to-reach terrain or crisis areas without the stakeholders and executive management's strong hand and back up. Funding and financial support are compulsory for consistent maintenance and upgrade of data collection equipment, tools, and technological infrastructure to execute data collection programs, staff training, and enforcement of reliable data collection policies.

IT managers should endeavor to conduct monthly or bi-monthly quality data assessments of collected data to ensure integrity. Also, review and update organizational data collection processes to align with global best practices and tackle current data collection procedures. The IT managers should apply the sensitization and advocacy strategy in communicating with respondents in any community or environment of reliable data collection needs and benefits. Advocacy and sensitization should include by-ins, one-to-one meetings with respondents and community leaders, town criers, campaigns, and adverts before the data collection exercise.

I shall publicize this study through different means. After I get approval from the CAO, Walden University scholar works would publish through ProQuest. I will disseminate my findings through e-mail to all the twelve participants who actively participated in this study. I will add a copy of this study to the list of my publications on Research Gate, Google Scholar, LinkedIn, and Academic.edu. I also anticipate citing the study in the future journal articles I will publish. These proposed actions will further extend the global impact and dissemination of this study.

Recommendations for Further Study

I base my recommendations for future research on my experiences while conducting this study, the knowledge I gained from the existing literature, and the discussions with participants. Considering IT managers' perceptions of reliability in data collection, the goal of this study was to explore strategies used by IT managers to ensure reliability of data collection so that future research could more precisely measure variables to examine the existence of further correlations. The specific limiting factor influencing the research process was finding IT managers with at least three years of working experience and willing to participate in the study. The available interviews were honest responses from the participants with organization data providing sufficient data for my analyses. In the future, I recommend that researchers should take time early enough to search for viable research participants to avoid spending more time seeking to obtain possible research participants. One other limitation to this study was that interviews with participants were virtual due to the COVID-19 pandemic as such; there was no one-to-one interview with participants, which would have been easier for me considering poor network connections in my locality.

There are quite a few recommendations for further study. The first and major recommendation is that government and other organizations should automate or digitalize all data collection processes in their organizations using modern technology. The manual method of data collection could slow down the data collection and reporting process and result in inaccuracy due to human errors resulting from fatigue, thereby hindering reliability of data collection. Currently, computer-based data collection strategies and

tools are progressively replacing the paper-and-pencil-based methods. Some participants in this study responded that though electronic data collection methods seem intricate, yet the use of technology has increased data quality and production.

The final recommendation is that future researchers could use another conceptual framework to extend the research. This recommendation will allow future researchers to utilize another lens or see the problem from another perspective. Future researchers could also consider using other quality data collection-related theories as a framework for further studies. These would allow the researcher(s) to explore other strategies or constructs not found in this study and examine strategies not captured.

Reflections

Completing my doctoral study was my uttermost desire, my experience during the study clearly showed that diligence, resilience, consistency, hard work, and patience produces success. My chair and other committee members supervised this research work with the uttermost sense of duty and support. The DIT study was so thorough and time-consuming; it has offered me a remarkable growth experience. I encountered several challenges beyond my imaginations, but I overcame them all with the help of God and encouragement from my chair. I have gained more knowledge regarding strategies used to ensure reliability in data collection, especially in government and other organizations.

I have been pulled out of classes several times due to financial constraints, spent sleepless nights but remained focused throughout the process. I communicated with my chair almost every week, flexible, very kind-hearted, and very thorough with my reviews. My chair and other committee members guided me through this study process. I was also

very patient with gatekeepers and participants. I feel very fulfilled and proud of myself that I continued and finished my DIT journey. I never gave up despite the numerous challenges faced during my entire program. To God be the glory.

In this journey, I have learned how to be a scholar-practitioner and a positive social change agent. I have also learned a lot about qualitative research and have developed both expert-level research skills and advanced-level IT skills added to my career. My doctoral study, "Reliable data collection: A tool for data integrity in Nigeria," aligns with my aspirations as an IT professional. I desire to see both government and other organizations in my country and Sub-Saharan Africa have credible data for decision-making and adequate planning goals. There was a bit of delay while waiting for letters of cooperation from the participating organizations and responses from my participants due to their busy work schedule, which was the criterion for IRB approval. I am happy I made it, I never gave up, and it was worth achieving.

Summary and Study Conclusions

This qualitative multiple case study intended to explore the strategies that IT managers use to ensure the reliability of data collection for decision making and adequate planning goals. Data quality is the yoke of data integrity. When data quality is low, it cannot be reliable and does not have integrity for decision making and cannot yield good results. IT managers must employ the best strategies to ensure the reliability of data collection in government and their organizations. Data collected from citizens must be used appropriately and results shown to boost citizens' trust to continue to release

accurate information when needed by the government and other organizations in the future.

The stakeholders and executive leadership should buy into the data collection policy and support reliable data collection processes with adequate funds, sensitization, technology, infrastructure, tools, and training. Stakeholders and IT managers should implement policies to drive data collection procedures and culture. Strategies such as education and training build reliability in data collection. One strategy is to educate and train IT managers, data collectors, and citizens on reliable data collection procedures. The study results show that reliability in data collection is implemented by employing DQA, education and training, use of technology, stakeholders and employee involvement, and sensitization and advocacy. Ensure adequate funding, resources, and infrastructures for reliable data collection in hard-to-reach terrains and provide security for data collectors under challenging zones.

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Appendix A: Interview Protocol

Title:

Participant ID:

Date: **Time:**

Interview Mode:

1. I will introduce myself to the participant(s) and describe my role as a student and the researcher
2. I will ensure signing of the Informed Consent form.
3. I will remind participant of their voluntary participation in the study and right to withdraw at any time
4. Briefly discuss the concept of data collection concerning to data integrity to enable policy development and decision making in government data information management and governance practices.
5. I will remind the participant that the interview will be recorded so the participant will know when recording begins
6. I will request that all discussion be confidential as all information provided should be treated as such and should not be disclosed to anyone, including his/her employer.
7. I will ask my research questions (as shown below) in a semi structured manner allowing for re-ordering of the questions depending on the progress of the interview
8. I will request for and collect any secondary data or artifacts from the participant
9. I will request for and schedule a follow-up member checking interview as date and time would be agreed by the participant.

10. I will thank the participant for his/her participation in this study at the end of the interview.

Appendix B: Interview Questions

Demographic Questions

What is your name?

How long have you been working for government and this organization?

What role do you play in strategic reliable data collection in your position?

Interview Questions

1. What strategies are you using in your ministry to ensure reliable data collection?
2. How did you implement these strategies to ensure reliable data collection in your organization?
3. What is your role in managing and implementing these strategies and why?
4. What are the changes in strategies while ensuring reliable data collection in your ministry?
5. What challenges did you face with reliable data collection for decision making in the ministry and why?
6. What strategy and method of success did you use to achieve reliable data collection.
7. What were your main concerns in your approach to ensure reliable data collection?
8. What infrastructure did the ministry put in place to achieve success?
9. What was the setbacks you may have had in other to apply the strategies you did in relation to manpower and tools used?
10. What other information would you like to add regarding reliable data collection strategies in Nigeria?

Appendix C: Invitation for Research Study Participation

Date:

Dear [Potential Research Participant],

My name is Whyte Stella Tonye, I am conducting a doctoral study for Doctor of Information Technology degree from Walden University, Minnesota, USA with title “Reliable data collection: A tool for data integrity”. The purpose of this qualitative multiple case study is to explore strategies used by some IT managers in government in Rivers State, Nigeria to ensure collection of reliable data to meet economic planning and adequate decision-making goals in other to distribute and manage resources at various levels of government. I am requesting your participation in the study. Participation in this study is voluntary, and you may choose to participate or not without risk to your well-being or safety. Participants may also choose to withdraw from this study at any time without retaliation or penalty. Your consent to participate in this study will be beneficial to social change because your personal information will be protected and your personal information from being compromised.

I have attached a consent form for a detailed description of the research student.

Thank you for your consideration.

Whyte Stella Tonye,

DIT Student College of Management & Technology
Walden University
Email: [redacted]

Appendix D: Letter of Invitation

[Name/Address]

Dear Sir/Madam,

My name is Whyte Stella Tonye, I am a doctoral candidate at Walden University working on doctoral study in the Doctor of Information Technology program. My doctoral study is entitled “Reliable data collection: A tool for data integrity”. The purpose of this qualitative multiple case study is to explore strategies used by some IT managers in government in Rivers State, Nigeria to ensure collection of reliable data to meet economic planning and adequate decision making goals in other to distribute and manage resources at various levels of government. I have chosen the {name of organization} as a potential participant in this study based on your professional role and expertise in data collection with the use of technology.

The study will require that I meet with some staff in your ministry with an IT work experience for at least three years or more. I will also collect nonproprietary information regarding data collection strategies and processes used by the ministry. The data collected will be kept confidential, and identity of potential participants will be protected. I will maintain privacy of all published data from this study on participants and the ministry to protect the identity of both the participants and the ministry. Minor associated risks in this study will be the interruption of routine work activities during the interview. Participation in this study is voluntary with no risk to the participant’s well-being or safety. Participants may choose to withdraw from the study at any time without penalty. Consent to participate in this study will be beneficial to social change because

the participant's personal information will be protected and prevent their personal information from being compromised. I will be glad to see you participating in this study.

Thank you very much for your consideration.

Sincerely,

Whyte Stella Tonye

Walden University
Doctoral Candidate
Email: [redacted]
GSM: [redacted]