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Evaluation of ISO 9001 Software-Based Quality Management Systems (SBQMS) By Construction Professionals in ONDO and EKITI States

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ABSTRACT

Many construction projects in Nigeria have experienced quality failures that do not align with ISO 9001 standards, often due to the reliance on manual quality management practices by professionals. This study evaluated the implementation of ISO 9001-based Standardized Building Quality Management Systems (SBQMS) by construction professionals in Southwest Nigeria, aiming to enhance construction project quality. Data were gathered from 400 construction professionals in Ondo, and Ekiti States. Descriptive and inferential statistics, including Partial Least Squares Structural Equation Modeling (PLS-SEM), were used to analyze the data with SPSS and SMART-PLS software.

The findings revealed that understanding client requirements and standardizing construction processes ranked highest among the 14 elements of ISO 9001 SBQMS. Additionally, Master Control, SAP Quality Management, and ETQ Reliance were identified as the most commonly used ISO 9001 SBQMS tools. The study also identified the need for training in Building Information Modeling (BIM), Artificial Intelligence (AI), and computer programming skills to support digital-based quality management in construction.

The research concluded that ISO 9001 quality management factors significantly impact project success, with a 95% confidence level (β=0.408, T=3.077, P=0.002). It emphasized that access to information and communication technology, advanced technologies, and robust regulations are essential for improving the adoption of ISO 9001 SBQMS. Therefore, clients should prioritize factors that foster the quality of construction projects.

Keywords: Construction professionals, ISO 9001, Quality management, Software-Based

I. INTRODUCTION

The construction industry is widely regarded as a project-based sector characterized by unique features and involving a range of stakeholders, including clients, contractors, and consultants, throughout the project lifecycle [27]. Construction projects bring together diverse individuals or organizations to form a temporary multi-organizational coalition. The quality of construction projects significantly influences overall project performance [12]. Effective quality management ensures projects are completed within scope, on time, within budget, and meet desired objectives [6]. However, research indicates that these goals are often unmet in the Nigerian construction industry [10] [18].

To address these challenges, ISO 9001 quality management systems were introduced to improve the procedures, processes, and documentation of construction projects from design through construction, occupancy, and eventual demolition [11] [29]. Additionally, the Nigerian construction industry is undergoing significant transformation, necessitating the adoption of digital quality management systems to enhance project performance [3].

Quality management systems play a crucial role in proactively addressing issues to prevent problems rather than reacting to them [21]. While manual quality management methods were historically used in the industry, the complexity of modern construction processes, advancements in information and communication technology (ICT), and demanding project objectives have necessitated a shift toward Software-Based Quality Management Systems (SBQMS) [22]. SBQMS is essential for achieving Total Quality Management (TQM), leading to improvements in safety and quality [31] [26]. These systems enable real-time monitoring, incident reporting, automatic alerts, and proactive quality management [29].

ISO 9001, an internationally recognized standard for quality management systems, provides a framework to ensure organizations consistently meet customer and regulatory requirements [4]. Built on

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principles such as customer focus, leadership involvement, process-based approaches, and continual improvement, ISO 9001 is a valuable tool for enhancing quality management practices and achieving sustainable success [19] [2] [15]. In the construction industry, implementing ISO 9001 helps ensure consistent project delivery, efficiency, regulatory compliance, and customer satisfaction [15] [26].

The success of SBQMS depends on stakeholder involvement, including clients, consultants, and contractors, to foster supportive structures and implement quality management strategies across projects [16]. Stakeholder collaboration, organizational culture, and leadership are essential for driving the adoption of ISO 9001 and SBQMS. The standard emphasizes inclusivity, evidence-based continuous improvement, client focus, and the adoption of digital quality management systems for effective quality management.

ISO 9001 follows a High-Level Structure (HLS) common to all ISO management standards, comprising scope, normative references, terms and definitions, organizational context, leadership, planning, support, operation, performance evaluation, and improvement. SBQMS provides advanced features, including automated calculations, Computer-Aided Design (CAD), continuous data acquisition, lifecycle support, product lifecycle management, block chain, artificial intelligence, the Internet of Things (IoT), and 4D Bu…

1.1 Statement of the Research Problem

Quality management in construction projects significantly enhances project performance and requires continuous improvement, particularly with advancements in Information and Communication Technologies (ICTs). Recently, the Nigerian Institute of Building (NIOB) conducted training sessions in Abuja and Lagos to enhance quality assurance and assessment. This underscores the importance of quality management for all building project stakeholders.

This research focuses on assessing the implementation of Software-Based Quality Management Systems (SBQMS) and the transition from manual quality management methods to SBQMS in the construction industry. Specifically, the study aims to examine the acceptability and implementation of SBQMS among building professionals in Southwest Nigeria, with a particular emphasis on Ekiti and Ondo states.

To contextualize the research, prior studies on quality management have largely focused on areas such as quality assurance [28], construction safety management [32], the application of CALS technology for quality management [30], digital quality management using BIM [5] [25], and construction quality information management with block chain [24]. Other studies have explored the application of IoT in quality management [14], the use of artificial intelligence (AI) for quality assurance [7], regulatory decoupling and ISO 9001 effectiveness in the construction sector [4], and comparative analyses of ISO 9001 adoption by certified and non-certified companies [26]. Furthermore, research has investigated the impact of ISO 9001 on project management and success factors [12].

However, empirical research on the implementation of SBQMS in Nigeria, particularly in Southwest Nigeria or states like Ekiti and Ondo, remains limited. Despite many construction companies in developed nations achieving ISO 9001 certification, which is founded on principles such as customer focus, leadership in quality management, relationship management, professional engagement, process monitoring, quality improvement, and evidence-based decision-making, the application of these principles in Nigeria has not been thoroughly examined.

This study aims to assess the application of ISO 9001 software-based quality management systems in Ekiti and Ondo states. These systems are designed to proactively address potential issues, preventing problems rather than reacting to them [8], [7]. By incorporating Total Quality Management (TQM), real-time monitoring, incident reporting, and automated alerts, SBQMS can significantly enhance safety and quality [31]. The study will also evaluate the awareness levels of construction professionals in these states regarding the use of ISO 9001 SBQMS to improve construction project quality.

The research assumes that current quality management practices in the construction industry do not fully align with ISO 9001 principles. Therefore, it will assess the training needs of construction professionals in Ekiti and Ondo states to facilitate the adoption of SBQMS. Additionally, the study will examine the barriers to implementing ISO 9001 SBQMS in these states, identifying factors that hinder adoption and exploring strategies to overcome these challenges.

1.2 Aim and Objectives of the Study

The aim of this research is to evaluate the use of digital-based quality management systems by building construction stakeholders in Southwest Nigeria, with the goal of improving the performance

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of building projects. To achieve this aim, the specific objectives of the study are:

1. To evaluate the level of awareness and adoption of ISO 9001 software-based quality management systems in Ondo and Ekiti States.
2. To analyze the key elements of ISO 9001 software-based quality management systems in Ondo and Ekiti States.
3. To identify the skills and training required for the effective implementation of ISO 9001 software-based quality management systems in the study area.
4. To examine the challenges and factors influencing the adoption and use of ISO 9001 software-based quality management systems in Ondo and Ekiti States.

1.3 Significance of the Study

One of the major challenges in the construction industry in developing countries is executing building projects efficiently and within planned timelines, while ensuring optimal quality without compromising the project's intended outcome [17]. This study addresses this challenge, making it a valuable undertaking. By assessing the use of ISO 9001 Software-Based Quality Management Systems (SBQMS) in Ondo and Ekiti States, the research will provide contractors, consultants, policymakers, and academia with a deeper understanding of the relationships among key variables.

Research has emphasized the importance of prioritizing quality in construction projects to improve overall performance [23], [20], [9], [1]. Enhancing project quality can reduce abandoned projects, improve cost efficiency, and bridge gaps in project delivery.

This study will provide critical insights into the current quality management systems used by construction professionals in Nigeria. It will also evaluate the level of awareness and adoption of ISO 9001 SBQMS among construction professionals in Ondo and Ekiti States. Furthermore, the study will highlight the training needs of construction professionals for effective SBQMS utilization and recommend strategies to address challenges hindering its implementation.

By focusing on these aspects, the study aims to enhance project quality and performance, contributing to the sustainable development of the construction industry in Southwest Nigeria.

II. RESEARCH METHODOLOG

This study adopts a quantitative research design using structured questionnaires with closed-ended questions to assess Software-Based Quality Management Systems (SBQMS) among building construction stakeholders in Ondo and Ekiti states. This approach ensures a detailed analysis by providing numerical data and insights into stakeholders' attitudes and experiences regarding quality management systems. A random sampling technique was used to select a sample size of 320 respondents.

The survey questionnaire was used to collect data on the types of quality management systems used, awareness of SBQMS among construction professionals, training needs for SBQMS, and factors influencing SBQMS implementation in the study areas. To maximize participation, the survey will be administered online and in person. The data collected will be analyzed to provide a comprehensive understanding of SBQMS usage and promote its adoption among stakeholders in Ondo and Ekiti states.

2.1 Study Area

This research was conducted in Southwest Nigeria, focusing on Ondo and Ekiti states, two economically significant regions in the country.

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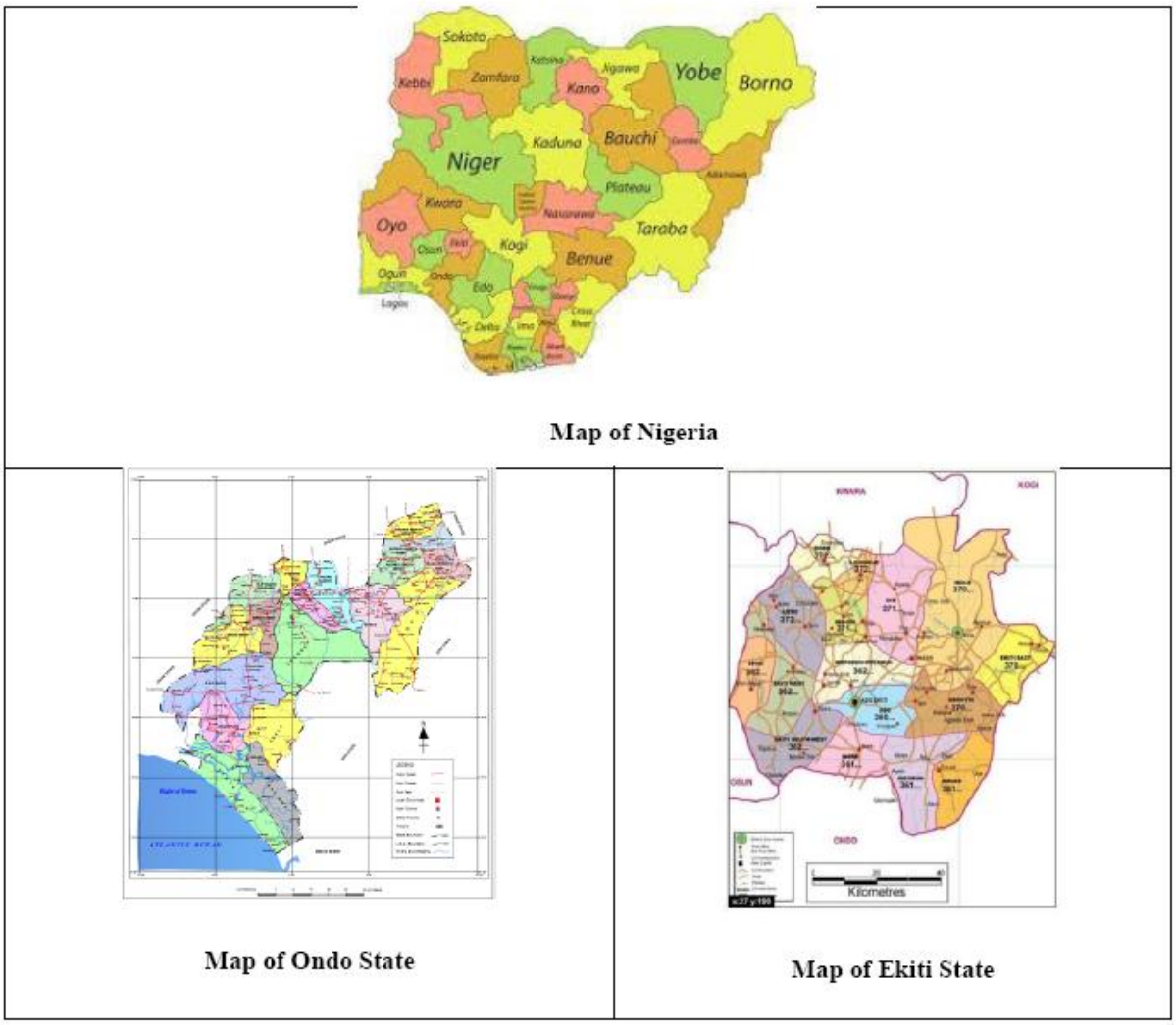

Figure 1: Map of the Study Area

2.2
Research Population

The study population consists of construction industry stakeholders in Southwest Nigeria, specifically in Ondo and Ekiti states. These stakeholders include architects, engineers, builders, and quantity surveyors, serving as contractors, consultants, or clients. The construction industry in these states significantly contributes to developing residential, commercial, and industrial properties, creating job opportunities for citizens.

To facilitate the research, a letter of introduction was obtained from the Head of the Department of Building at the Federal University of Technology, Akure, Ondo State. The primary data collection instrument is a structured research questionnaire designed to gather relevant information from the respondents.

2.3 Sample Size and Sampling Technique
2.3.1 Sampling technique

Sampling involves selecting a representative subset from a given population. Various sampling techniques exist, including simple random sampling, systematic sampling, cluster sampling, quota sampling, deliberate sampling, and stratified sampling. This study employs a simple random sampling method to gather the necessary data. This approach ensures that every member of the population in the study area has an equal chance of being selected, promoting fairness and diversity in the sample.

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A survey instrument will be used to collect data from the selected participants. Developed based on a thorough literature review, the instrument focuses on the awareness, implementation, and factors affecting the use of Software-Based Quality Management Systems (SBQMS) among building construction stakeholders in Ondo and Ekiti states. The survey instrument will undergo pretesting to confirm its validity and reliability.

The finalized survey will be distributed to construction stakeholders actively involved in SBQMS within the study area. This ensures responses are gathered from a diverse and experienced group of professionals, capturing valuable insights into SBQMS usage and awareness. The data collected will help provide a comprehensive understanding of SBQMS practices and their impact on quality management in the building construction sector.

2.3.2 Sample size

A sample refers to a smaller group of subjects selected from a population to draw conclusions about the targeted group. In this study, 340 professionals from the construction sector in Ondo and Ekiti States, Nigeria, participated by completing questionnaires. Participants were selected using an availability sampling technique, focusing on individuals who were accessible and willing to participate.

The questionnaire contained 15 structured questions designed to evaluate the awareness, implementation, and use of Software-Based Quality Management Systems (SBQMS) among building construction stakeholders in the study area. The sample size was determined using the Yamane formula to ensure statistical validity and reliability. This approach provided a diverse range of responses, enabling a comprehensive analysis of SBQMS adoption and its impact in the construction industry.

$n = N/1+N(e^2)$

Where n = sample size
N= Total population
e= Level of precision which is

$$n = \frac{1{,}599}{1 + 1{,}599\ (0.05)^2}$$

$$n = \frac{1{,}599}{49975} = 319$$

320 questionnaires was shared.

Table 1: Sample Size of the Project Stakeholders

S/No	Professionals	Ondo State	Ekiti State	Total	Sample Size
1	Builders	99	150	249	53
2	Quantity surveyors	105	120	225	48
3	Architects	160	170	330	70
	Engineers				
4	Structural	130	140	270	57
5	Mechanical	120	130	250	53
6	Electrical	130	145	275	59
	TOTAL	744	855	1,599	320

2.4 Method of Data Collection

This research involved designing a series of questions to assess the awareness and implementation of digital-based quality management systems among building construction stakeholders in Southwest Nigeria. Using a random sampling technique, professionals from Ondo and Ekiti States were selected to participate. Questionnaires were distributed electronically via email and messaging platforms, with participants given a specific timeframe to complete them.

The collected data was analyzed using descriptive statistics, including measures like mean, median, and mode. Additionally, techniques such as correlation and regression analysis were employed to explore relationships between variables. Based on the results, conclusions and actionable recommendations will be provided to encourage the adoption of ISO 9001 Software-Based Quality Management Systems (ISO 9001-SBQMS).

The findings will be compiled into a detailed report, featuring a summary of responses, an in-depth data analysis, and practical recommendations aimed at improving quality management practices in the construction industry in Southwest Nigeria.

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2.5 Data Collection Instrument

To gather primary data for this research, a carefully designed survey questionnaire was utilized. The questionnaire included a combination of closed-ended and open-ended questions, aimed at evaluating the awareness and implementation of Software-Based Quality Management Systems (SBQMS) among building construction stakeholders in Ondo and Ekiti States.

The survey focused on several objectives: assessing the awareness and adoption levels of ISO 9001 SBQMS, identifying the key elements of ISO 9001 SBQMS, determining the skills and training required for effective SBQMS use, and evaluating the challenges and factors influencing the implementation of ISO 9001 SBQMS in the study area.

The questionnaire was divided into two main sections. The first section gathered background information about the respondents, while the second addressed the core research objectives. Topics explored included the quality management systems currently employed by construction professionals, their level of awareness regarding ISO 9001 SBQMS, the training needs for its adoption, and the challenges hindering its effective implementation.

To ensure data quality and representativeness, the questionnaire was subjected to a pilot test with a small group of respondents. This helped assess its reliability and validity, with adjustments made based on feedback. Following the pilot test, the survey was distributed to a diverse group of construction professionals across various roles and organizations, ensuring the inclusion of varied perspectives.

The data collected through this process provided a comprehensive understanding of SBQMS adoption and implementation in Ondo and Ekiti States, contributing valuable insights into advancing quality management practices in the construction sector.

2.6 Method of Data Analysis

The data was analyzed using the Statistical Package for Social Sciences (SPSS) with techniques such as frequency distribution, percentage, and mean item score (MIS). Results were presented in tables, utilizing percentile, mean, standard deviation, and factor analysis. Ranking was determined based on the highest MIS, with the factor scoring the highest ranked first, followed by others in descending order. This approach ensured a clear and systematic evaluation of the data for accurate conclusions.

III RESEARCH FINDINGS

A total of 320 questionnaires were administered in the study, focusing on various demographic and professional characteristics of the respondents. These included age, project location, gender, educational qualifications, years of experience, professional groups, types of construction projects executed, roles in construction projects, involvement in quality management, and familiarity with quality management standards. Out of the total distributed, 237 questionnaires (representing a response rate of 74.06%) were retrieved and deemed sufficient for the study, as per Kothari's [13] recommendation. The collected data spanned values from 1 to 6, with the highest mean recorded at 4.37 and the lowest at 1.05. The standard deviation (S.D.) of the responses ranged from 0.22 to 2.41.

3.1 Respondents' Involvement in Quality Management and ISO 9001

The study revealed that 84.80% of respondents had been involved in quality management of construction projects. Moreover, 93.20% indicated familiarity with ISO 9001 quality management systems, demonstrating a strong engagement with recognized quality management standards.

3.2 Assessment of ISO 9001 Software-Based Quality Management Systems

The study examined the elements of ISO 9001 software-based quality management systems (SBQMS) in Ondo and Ekiti States.

The most highly ranked elements included:

Standardized construction processes (Mean Score [MS] = 3.89; S.D. = 0.70; t = 84.65), Focus on customer satisfaction (MS = 3.85; S.D. = 0.59; t = 100.18), Encouragement of innovation in construction techniques, materials, and processes (MS = 3.83; S.D. = 0.81; t = 72.72), Risk assessment, management, and implementation (MS = 3.80; S.D. = 0.79; t = 73.99), Workflow optimization for higher quality outcomes (MS = 3.78; S.D. = 0.77; t = 75.71),

Conversely, the least ranked elements were:

Continuous project review and feedback (MS = 3.64; S.D. = 0.82; t = 68.26), Data collection and analysis across construction stages (MS = 3.61; S.D. = 0.94; t = 59.37)

3.3 Implementation of ISO 9001 Standards in Construction

The study also explored the extent of ISO 9001 construction quality standards implementation in Ondo and Ekiti States.

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Respondents ranked the following as the most implemented:
Customer focus (MS = 4.43; S.D. = 0.79; t = 20.17), Process-driven quality (MS = 4.27; S.D. = 0.70; t = 94.38), Evidence-based quality management (MS = 3.92; S.D. = 0.68; t = 89.04), Continuous improvement (MS = 3.90; S.D. = 0.68; t = 88.51), Workflow leadership (MS = 3.52; S.D. = 0.66; t = 82.05)

The least ranked aspects of implementation were:
Engagement of personnel in quality management (MS = 3.43; S.D. = 0.83; t = 63.67), Relationship management (MS = 3.41; S.D. = 0.99; t = 53.29)

3.4 Awareness of Software-Based Quality Management Systems (SBQMS)

The study evaluated the level of awareness among construction professionals regarding various SBQMS tools.
The highest levels of awareness were recorded for:
SAP Quality Management (MS = 2.52; S.D. = 0.90; t = 59.96), Sparta Systems TrackWise (MS = 2.51; S.D. = 0.96; t = 56.52), Master Control (MS = 2.50; S.D. = 0.90; t = 60.21), Oracle Fusion Cloud Product Lifecycle Management (PLM) (MS = 2.49; S.D. = 0.73; t = 73.83), ETQ Reliance (MS = 2.48; S.D. = 0.73; t = 73.51)

The least recognized systems were:
IQMS (MS = 2.23; S.D. = 1.09; t = 45.48), Windchill (MS = 2.12; S.D. = 1.15; t = 41.57)

Skewness statistics for awareness levels ranged from -0.023 to +0.332, while kurtosis values ranged from -0.120 to 1.090. These values indicated that the data was negatively skewed and non-significant, with all mean scores below 3.00.

3.5 Skills and Training Needs for SBQMS Implementation

The study identified critical skills and training required by construction professionals to adopt SBQMS in Ondo and Ekiti States.
The most important skills included:
Computer programming (MS = 4.13; S.D. = 0.76; t = 18.61), Artificial Intelligence (AI) (MS = 4.05; S.D. = 0.76; t = 82.14), Machine Learning (ML) (MS = 4.03; S.D. = 0.79; t = 78.83), Internet of Things (IoT) (MS = 3.95; S.D. = 0.84; t = 72.03), Information and Communication Technology (ICT) (MS = 3.78; S.D. = 0.77; t = 75.71)

Less prioritized skills were:
Active listening (MS = 3.67; S.D. = 0.63; t = 89.39), Smart building application (MS = 3.66; S.D. = 0.78; t = 72.27)
A Kaiser-Meyer-Olkin (KMO) test assessed the reliability of the identified skills and training needs, grouping them into five factors: management, software usage, design, programming, and communication. The overall KMO value was 0.765, with group values ranging from 0.697 to 0.747. Bartlett's test of sphericity was significant (p = 0.015), confirming the reliability of the five-factor solution.

3.6 Factors Affecting SBQMS Adoption

The study also analyzed factors influencing SBQMS adoption in construction projects.
The most significant factors were:
Experience of project team members (MS = 4.60; S.D. = 0.68; t = 81.55; bi = 0.048), Accuracy of estimates and designs (MS = 4.50; S.D. = 0.74; t = 98.47; bi = 0.045), Availability of ICT infrastructure (MS = 4.45; S.D. = 0.71; t = 68.86; bi = 0.042), Advanced technology and innovation (MS = 4.40; S.D. = 0.70; t = 72.96; bi = 0.042), Company training programs (MS = 4.30; S.D. = 0.73; t = 72.72; bi = 0.039)

The least significant factors included:
Lack of experience (MS = 3.10; S.D. = 0.86; t = 65.01; bi = 0.018)
Changes in specifications, often due to bribery

Using bias analysis, the factors were ranked as upper, middle, or lower. Upper-ranked factors were team experience, design accuracy, ICT availability, advanced technology, and training. Middle-ranked factors included resource availability, team coordination, and stakeholder communication. Lower-ranked factors encompassed financial stability and government policies, with specification changes and lack of experience ranking the lowest.
The findings highlight critical elements, implementation levels, awareness, skills, and factors influencing the adoption of SBQMS in construction projects in Ondo and Ekiti States. These insights provide a foundation for improving quality management practices, emphasizing skills development, and addressing barriers to SBQMS adoption.

IV CONCLUSIONS

1. The major elements of ISO 9001 software-based quality management systems in Ondo and Ekiti State are standardize construction processes, concentration on customer satisfaction and

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Volume 6, Issue 1, Jan.-Feb, 2025 pp: 50-60 ISSN: 2584-2145 www.ijemh.com

encouragement of innovation in construction techniques, materials, and processes, risk assessment, management, and implementation of quality managements, and workflow optimization and higher quality outcomes of construction processes.

2. The least ranked elements of ISO 9001 software-based quality management systems in the study area are continuous project review and feedback and data collected and analysis at various stages of construction projects.
3. The level of implementation of ISO 9001 construction quality standards in Ondo and Ekiti State are customer focus, quality by process, evidence based quality management, Continuous improvement, and workflow leadership.
4. The least ranked level of implementation of the ISO 9001 construction quality standards are engagement of people in quality management, and relationship management**.**
5. The major level of awareness of construction professionals on the use of Software- Based Quality Management System (SBQMS) in Ondo and Ekiti State are SAP quality management, Sparta Systems TrackWise, Master control**,** Oracle Fusion Cloud Product Lifecycle Management (PLM)**,** and ETQ Reliance**.**
6. The least ranked level of awareness of construction professionals on the use of (SBQMS) are IQMS and Windchill**.**
7. The result of the of Skewness statistics of the level of awareness of construction professionals
8. On the use of Software- Based ranges from -0.023 to + 0.332 while the Kurtosis statistics ranges from -0.120 to 1.090.
9. The result of the Skewness statistics and Kurtosis statistics of the level of awareness of construction professionals on the use of Software- Based are all negative and are not significant (Skewness ≥ -1.00 or Kurtosis ≥ -1.00), and all the mean score are lower than 3.00 (MS≤ 3.00),
10. The major skills and trainings needed by construction professionals to use Software-Based Quality Management System (SBQMS) in Ondo and Ekiti State are computer programming skills**,** artificial intelligence training**,** machine learning skills internet of things skills**,** and information and commutation technology skills**.**
11. The least ranked skills and trainings needed to use (SBQMS) are Active listening skills and application of smart building skills**.**
12. The result of the reliability test (Kaiser-Meyer-Olkin KMO) onducted on the skills and trainings needed by construction professionals to enable them use (SBQMS) reduced the twenty (20) Skills and Trainings needs into five (5) factor solutions, namely management skills and trainings, software usage skills and trainings, design skills and trainings, programming skills and trainings, and communication skills and trainings.
13. The Kaiser- Meyer- Olkin (KMO) value for the 20 items is 0.765 while the (KMO) for each group is 0.702, 0.697, 0.736, 0.747and 0.732. The Bartlett's text of sphericity for the three factors loading is significant (p= 0.015). The reliability test was conducted for the five factors and the result ranges from 0.697 to 0.747, which is greater than 0.5 hence, the five factors loaded are reliable.
14. The factors affecting the use (SBQMS) for construction projects are experience of project team members, accuracy of estimate and design, availability of information and communication technology, availability of advanced technology and innovation, and company training
15. The least ranked factors affecting the use of (SBQMS) for construction projects are lack of experience and changes in specifications (bribery) to cut corners.
16. The result of the Bias analysis was used to rank the factors affecting the use of (SBQMS) for construction projects grouped the factors into upper, middle, Lower and bottom ranked factors. The upper ranked factors are experience of project team members, accuracy of estimate and design, availability of information and communication technology and availability of advanced technology and innovation, and company training. The middle-ranked factors are availability of resources, coordination and operation of team members, and stakeholders' communication and support The Lower-ranked factors are financial Stability and government policies. Notably, factors at the bottom of the rankings includes changes in Specifications and lack of Experience.

4.1 Recommendations

Based on the findings of this research, the following recommendations are proposed for assessing ISO 9001 Software-Based Quality Management Systems (SBQMS) by construction professionals in Ondo and Ekiti States:

1. Enhance Awareness and Adoption of ISO 9001 SBQMS

Efforts should be made to increase the awareness and adoption of ISO 9001 software-based quality management systems in Ondo and Ekiti States. This will encourage the standardization of construction processes, a greater focus on customer satisfaction, and the promotion of innovation in construction techniques, materials, and processes. Additionally, risk assessment, management, and the implementation of quality management practices, along with workflow optimization, will contribute to higher quality outcomes in construction projects.

2. Improve the Implementation of ISO 9001 Quality Standards

To enhance the overall quality of construction projects, it is recommended that the level of implementation of ISO 9001 construction quality standards be prioritized. Focusing on customer-centered construction, process-driven quality, evidence-based management, continuous improvement, and workflow leadership will help improve the quality of construction projects in the region.

3. Increase Awareness of SBQMS Tools

The study highlighted that construction professionals in Ondo and Ekiti States are familiar with tools like SAP Quality Management, Sparta Systems Track Wise, Master Control, Oracle Fusion Cloud Product Lifecycle Management (PLM), and ETQ Reliance. Efforts should be made to expand the use of these systems and to ensure broader familiarity among construction professionals with SBQMS tools to improve the efficiency and quality of construction projects.

4. Address Low Awareness and Adoption of SBQMS

Given that the skewness and kurtosis statistics for the use of SBQMS are negative (Skewness $\geq$ -1.00 or Kurtosis $\geq$ -1.00), and all mean scores are lower than 3.00 (MS $\leq$ 3.00), it is crucial to address the low levels of awareness and adoption. More training programs, workshops, and awareness campaigns should be implemented to boost the usage and understanding of SBQMS in the construction industry.

5. Focus on Key Factors Influencing SBQMS Adoption

Factors such as the experience of project team members, accuracy of estimates and designs, availability of information and communication technology (ICT), access to advanced technology and innovation, and company training need to be addressed. Focusing on these factors will significantly improve the quality of construction projects and foster better utilization of SBQMS, leading to more efficient and effective project management and execution.

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