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Development and Validation of Framework for Revitalization of Construction Crafts Apprenticeship Programmes

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Abstract: The construction industry in Nigeria is facing issues related to shortage of skilled craftsmen due to the progressive decline of traditional apprenticeship programmes. Despite their historical effectiveness in producing competent craftsmen through workplace-based, master-apprentice learning, construction crafts apprenticeships have deteriorated over recent decades. This study addresses this challenge by developing and validating a framework for the revitalization of construction crafts apprenticeship programmes. The proposed framework adopts a multi-level, systems-oriented approach structured around four interdependent pillars: (1) Policy and Regulatory Foundation, (2) Institutional and Partnership Architecture, (3) Curriculum and Delivery System, and (4) Support and Inclusivity Mechanisms. A sequential exploratory mixed-methods design was employed, comprising systematic literature review, semi-structured interviews, thematic analysis, expert validation through a modified Delphi technique and stakeholder applicability workshops. High consensus was achieved among diverse experts and stakeholders, confirming the framework's relevance, completeness, feasibility, and cultural appropriateness for the Nigerian milieu. The validated framework offers a robust and practically oriented blueprint for rebuilding sustainable, high-quality apprenticeship systems that preserve the strengths of traditional workplace engagement while incorporating structured quality assurance, inclusivity measures, and responsiveness to contemporary demands such as sustainable construction and digital competencies.

Keywords: construction, crafts, apprenticeship, revitalization, framework

INTRODUCTION

The construction industry remains one of the largest employers of skilled and semi-skilled labour worldwide. In Nigeria, this industry serves as one of the key sectors that plays significant roles in the economic development, infrastructure provision and urban transformation. However, despite its economic importance, the sector continues to face a persistent and deepening crisis in skilled labour supply especially at craft-level (Auta & Onwusuru, 2022; Habu, Angulu, & Hamza, 2025). This crisis can be seen through the glaring declined interest among young people to acquire skills in construction trades and the inadequate training given to the few who cares to key into the construction crafts (Bustani, 2018; Okuntade, 2020). This unwanted situation creates significant gaps between industry requirements and the competencies possessed by newly trained craftsmen.

Historically, apprenticeship has been the dominant and most effective mode of skill acquisition programme being practiced in the building and construction trades globally. The traditional apprenticeship systems especially in bricklaying, blocklaying, concreting, carpentry,

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tiling, plastering, painting, iron bending, electrical installation, plumbing, welding, fabrication trades among others have produced generations of highly competent craftsmen (Dubem, Stephen, & Oluwaseyi, 2022). That was achieved through its inherent attributes of long-term, work-based learning under master craftsmen (Lerman, 2019). However, over the past decades construction crafts apprenticeship programmes in Nigeria have experienced progressive decline and, in many cases, near-collapse (Onyema & Iwu, 2023). Several interconnected factors have contributed to this undesirable situation.

For instance, the societal shift towards formal institutional technical and vocational education and training (TVET) at the expense of workplace-based learning (Ekewke, 2017); wearying of traditional master-apprentice relationships due to urbanisation and changing social values (Olulu & Udeora, 2018); increasing requirement for payment of trainee fee by the master-trainer and shortening of training periods; poor regulation, certification, and quality assurance mechanisms (Liadi & Olutayo, 2017); low social recognition and remuneration for manual construction tradesmen (Eneh, Effiong, Olufemi, Okongo & Omosebi, 2023); rapid technological change and introduction of new materials/systems without corresponding update in training content had adversely affected the apprenticeship programme (Adah, Daniel, & Tunji-Olayeni, 2025). The consequence is that, the country is left with a labour force that is characterised by inadequate craftsmanship leading to proliferation of semi-skilled and unskilled labour and persistent low-quality construction works.

Though, several studies have examined the general challenges of Technical and Vocational Education and Training systems in Nigeria and even other developing countries (Ali, Okwo, Nwakile & Ejiofor, 2018; Auta, 2022), there appears to be relatively few that have specifically addressed the the issues surrounding the revitalisation of construction crafts apprenticeship programmes. This is despite the fact that it is a distinct and specialised form of skill development programme (Liadi & Olutayo, 2017). There are even fewer attempts to develop and empirically validated frameworks specifically tailored to the unique characteristics of the construction sector.

This study addresses this knowledge and practice gap by developing and validating a comprehensive framework for the revitalisation of construction crafts apprenticeship programmes. The proposed framework seeks to integrate contemporary understanding of work-based learning, competency-based training principles, stakeholder collaboration models, and context-specific realities of developing construction industries. Thus, the specific purposes of this study are to:

1. Develop a multi-dimensional framework for revitalising construction crafts apprenticeship programmes.
2. Validate the framework through expert evaluation, stakeholder consultation, and applicability assessment in the context of Nigerian construction industry.
3. Provide actionable policy, institutional, and programme design recommendations for implementation

Theoretical Framework

The theoretical underpinnings of this study are anchored in several complementary theories that explain how skilled craft knowledge is acquired, transmitted, and sustained in construction contexts.

Situated Learning and Legitimate Peripheral Participation

Lave and Wenger (1991) conceptualize learning as a social process occurring through participation in communities of practice. In traditional construction apprenticeships, learners begin at the periphery of practice (e.g., observing and performing simple tasks) and progressively move toward full participation as they gain mastery under the guidance of

master craftsmen. This theory underscores the superiority of workplace-embedded learning over purely classroom-based instruction, particularly for tacit, embodied skills in trades such as masonry, carpentry, and plastering.

Cognitive Apprenticeship

Building on situated learning, the cognitive apprenticeship framework (Brown, Collins, & Holum, 1989; Collins, Brown, & Newman, 1989) emphasizes making thinking visible through methods such as modelling, coaching, scaffolding, articulation, reflection, and exploration. In construction, this translates to master craftsmen explicitly demonstrating not only physical techniques but also decision-making processes (e.g., material selection, problem diagnosis on-site, and safety judgements), thereby bridging the gap between explicit and tacit knowledge.

Competency-Based Training (CBT) Principles

CBT shifts focus from time served to demonstrated mastery of specific, observable competencies. This approach, widely adopted in modern apprenticeship systems globally, aligns training outcomes with industry performance standards (Boahin, 2018). In construction, competencies encompass technical skills (e.g., accurate bricklaying to tolerances), safety awareness, spatial reasoning, tool proficiency, and emerging requirements such as sustainable construction practices and digital literacy.

Human Capital and Stakeholder Theory

Becker's (1964) human capital theory views apprenticeship investment as yielding long-term economic returns through improved productivity and employability. Stakeholder theory (Freeman, 1984) highlights the need for collaborative governance involving multiple actors such as government agencies, industry associations, employers, trade unions, training institutions, and apprentices in order to ensure system sustainability and shared responsibility. These theories collectively support the shift from traditional, unregulated, informal apprenticeships toward structured, hybrid models that preserve the strengths of workplace engagement while incorporating quality assurance, inclusivity, and responsiveness to technological and market changes.

METHODS

This study adopts a sequential exploratory mixed-methods design to develop and validate a framework for revitalizing construction crafts apprenticeship programmes in Nigeria. The methodology is structured in three sequential phases (Creswell, 2013), ensuring that each stage builds iteratively on the previous one:

Phase 1: Exploratory Qualitative Inquiry and Framework Development

This is the first phase which focused mainly on understanding the extent and nature of decline of apprenticeship system in Nigeria through identification of key revitalization elements, and synthesizing a draft conceptual framework through the following activities:

1. Literature was reviewed and documents were analyzed to enable the researcher map out historical trends, causative factors of decline and identify promising revitalization practices.
2. Semi-structured interviews were held with 10 purposively selected key individuals including master craftsmen in order to explore their individuals' live experiences, barriers, enablers and perceived requirements for effective revitalization.
3. The qualitative data obtained from the documentation analysis and literature reviews were analyzed thematically in line with Braun and Clarke's (2006) six-phase thematic analysis process. The emergent themes are presented in the results section.

Phase 2: Expert Validation Using the modified Delphi Technique

The draft framework was subjected to expert validation through a modified Delphi method. The use of Delphi technique is appropriate for framework validation in vocational education and training because it facilitates anonymous, iterative consensus-building among experts while minimising group biases (Nworie, 2011; Auta, Giwa, Gowon, Buba, & Tafida, 2021).

Expert panel selection

18 experts representing diverse interests - 6 from academia, 5 from industry, 4 from regulatory bodies (including NBTE and ITF), and 3 from trade unions/crafts associations were purposively sampled. The selection criteria included minimum of 10 years' experience in construction crafts training/apprenticeship and demonstrated expertise in Nigerian TVET or skills development.

Delphi rounds

Three iterative rounds were exclusively conducted online by distributing the structured questionnaires via Google Forms and email. The details of the activities in the three iterative rounds are discussed below:

Round 1 – The panel of experts rated the relevance, clarity, completeness and feasibility of each framework component on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). An open-ended provision was made for their comments for suggestions which was effectively utilized by the experts.

Round 2 - Aggregated feedback (means, standard deviations, consensus levels ≥70%) and revised framework elements were presented to the panel of experts for re-rating and comment.

Round 3 – This is a final consensus-building round which focused on resolving remaining discrepancies. A ≥75% agreement threshold was adopted as the criterion for inclusion of elements.

Phase 3: Applicability Assessment and Refinement

The validated framework was subjected to contextual applicability testing through virtual stakeholder workshops with 42 participants, including master craftsmen, employers, apprentices, and policymakers. The objective was to assess the framework's practicality, cultural relevance, and implementation feasibility. Insights gained from the workshop were triangulated with Delphi results to produce the final framework.

RESULTS

Framework Development

The framework development started with a thorough review of the decline of apprenticeship systems in Nigeria, identifying key revitalization elements, and synthesizing a draft conceptual framework. That was achieved through the following series of activities:

Literature review and document analysis

A systematic review of academic literature, policy documents, industry reports, and case studies from global, African and Nigerian contexts was conducted (Andersson & Wärvik, 2015; Fajobi, Olatujoye & Adedoyin, 2017). This is to enable the researcher map out historical trends, causative factors of decline and identify promising revitalization practices.

Semi-structured interviews

In-depth interviews were held with 10 purposively selected key individuals, including master craftsmen, members construction industry professional associations (e.g., Nigerian Institute of Building, Nigeria Society of Engineers), TVET institutions (e.g., NBTE-accredited polytechnics and technical colleges), government agencies (e.g., ITF – Industrial Training Fund), and former apprentices who are now in practice. The interviews explored their

individuals' live experiences, barriers, enablers, and perceived requirements for effective revitalization.

Thematic analysis

The qualitative data obtained from the documentation analysis and literature reviews were analyzed in line with Braun and Clarke's (2006) six-phase thematic analysis process. The emergent themes resulted in a draft multi-level revitalization framework encompassing four pillars as presented in Table 1:

Table 1: Revitalization Framework Pillars

Pillars	Themes
Pillar 1	policy/regulatory
Pillar 2	institutional/partnership
Pillar 3	curriculum/delivery
Pillar 4	support/inclusivity

Framework Validation

The developed framework underwent rigorous validation through a modified Delphi technique and stakeholder applicability assessment as presented below:

Delphi Expert Panel Results

A panel of 18 experts drawn from diverse areas of interest participated in three online iterative rounds. The demography of the Delphi experts is presented in Table 2:

Table 2: Demography of Delphi experts

Stakeholder Group	Number of Experts	Percentage
Academia	6	33.3%
Industry	5	27.8%
Regulatory Bodies	4	22.2%
Trade Unions / Crafts Associations	3	16.7%
Total	18	100%

The results of the Delphi expert Panel are presented in Table 3.

Table 3: Delphi expert Panel

Round	Components Rated	Mean Score Range	Components Reaching Consensus*	Overall Agreement ≥75%	Remarks
1	52	3.41–4.63	37 (71%)	71%	15 items required revision
2	52	3.93–4.77	46 (88%)	88%	Significant improvement after feedback
3	52	4.21–4.73	48 (92%)	92%	≥90% on core elements

Round 1: The experts rated 52 individual components/elements presented to them on relevance, clarity, completeness, and feasibility. At the end, 37 statements (71%) achieved initial consensus (mean ≥4.02 and ≥70% agreement), while 15 statements required refinement largely due to the comments and suggestions made by some of the experts on how to improve the draft framework which were duly noted and considered.

Round 2: The revised elements and aggregated feedback were re-presented to the panel of experts. After thorough review, the consensus improved significantly, with most remaining items reaching ≥75%.

Round 3: The final round effectively resolved minor discrepancies that emerged from the second round. Overall, high consensus was achieved with Mean scores across all pillars ranged from 4.21–4.73 on 5-point scale. An agreement was recorded on 48/52 components; while a ≥90% level of agreement was gotten on core elements such as hybrid delivery model, tripartite councils, competency standards, inclusivity mechanisms.

Stakeholders' Virtual Workshop on Applicability Assessment

The virtual stakeholders' workshop organized to assess the feasibility and applicability of the framework had 42 participants drawn from the pools of master craftsmen, employers, current/former apprentices, and policymakers. Their distribution is presented in Table 4.

Table 4: Distribution of Stakeholders' Virtual Workshop participants

Participant Category	Number	Percentage
Master craftsmen	12	28.6%
Employers	10	23.8%
Current & former apprentices	9	21.4%
Policymakers	7	16.7%
TVET Teachers	4	9.5%
Total	**42**	**100%**

The participants rated the overall applicability which affirmed the framework's potential to address key barriers to successful implementation of apprenticeship programme in construction crafts. The summary of the interactions among stakeholders during the virtual workshop are presented in Table 5. Suggested modifications from the virtual workshop including phased implementation starting with pilot sites were integrated.

Table 5: Summary Virtual Workshop on Applicability Assessment

S/N	Dimensions Presented for Review	Results
1	Overall relevance to Nigerian construction sector	Addresses real barriers effectively
2	Feasibility of implementation	Requires phased rollout & funding
3	Cultural & contextual appropriateness	Builds on traditional master-apprentice system
4	Potential to improve youth interest & participation	Strong support for image laundering campaign and payment of stipends
5	Adequacy of inclusivity measures including women and disadvantaged groups	Gender inclusivity adequately safeguarded

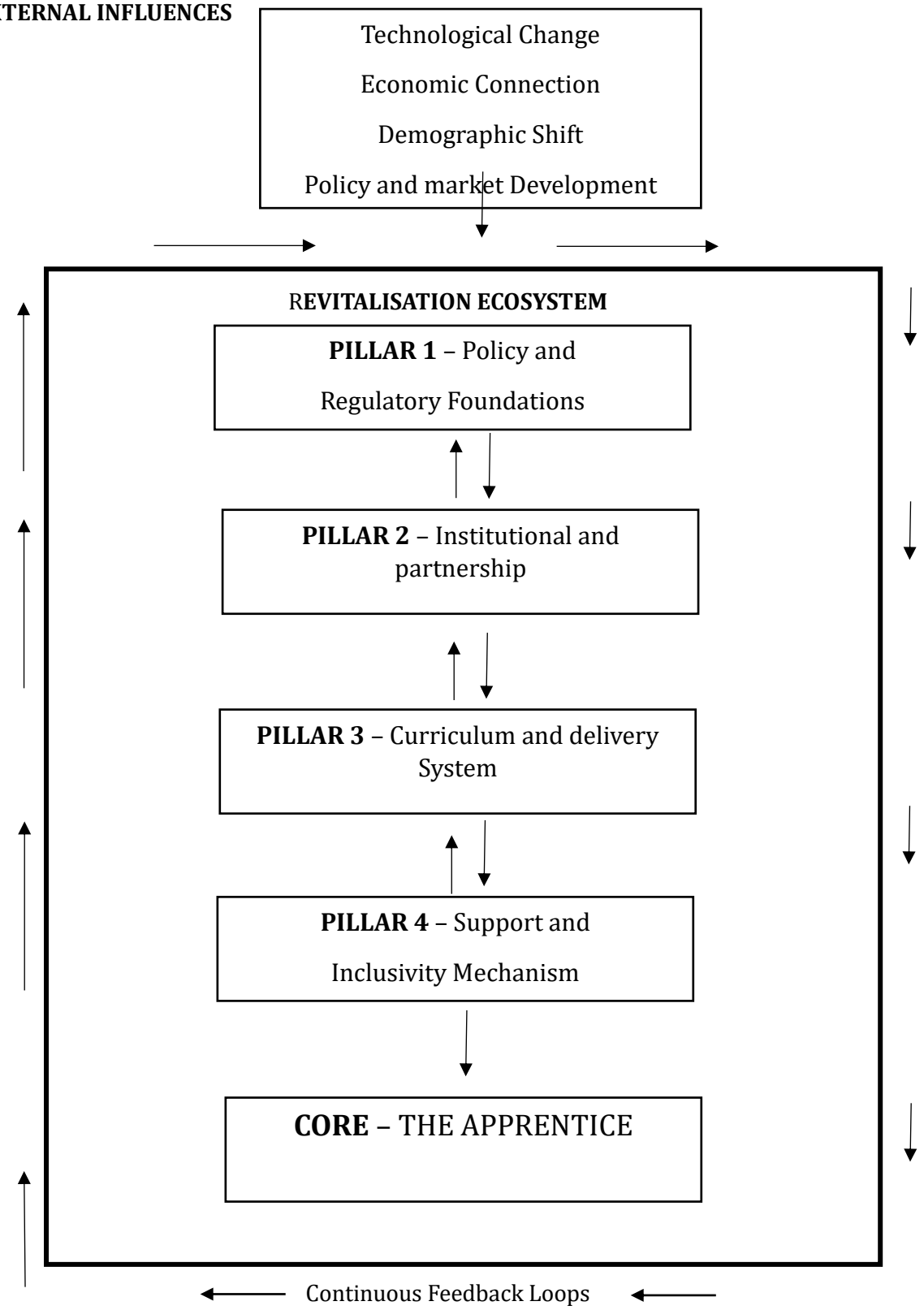
The triangulation of the results obtained from Delphi consensus, workshop insights, and initial qualitative data confirmed the framework's robustness, relevance, and readiness for implementation. High levels of agreement among diverse stakeholders provide strong validity evidence for its adoption in Nigeria.

The validated framework offers a structured blueprint for policymakers, industry leaders, and training providers to rebuild sustainable, high-quality construction crafts apprenticeship systems capable of meeting modern demands while preserving cultural heritage.

The Proposed Revitalization Framework

The proposed Revitalization framework is presented in Figure 1.

Figure 1: Schema of the Proposed Revitalization Framework



The revitalization framework presented in figure 1 represents a comprehensive, multi-level intervention model specifically tailored for construction crafts apprenticeship programmes in Nigeria. The framework preserves the dependable, practice-based essence of

traditional master-apprentice learning while incorporating modern quality assurance, inclusivity, and responsiveness to contemporary industry demands.

The framework is organized around four pillars, each containing specific components, strategies, and responsible actors. These pillars operate as a dynamic ecosystem, with continuous feedback loops for adaptation and improvement.

Pillar 1: Policy and Regulatory Foundation

This pillar establishes the enabling environment through enforceable standards, incentives, and oversight mechanisms. Some of the key components include the enactment or strengthening of national legislation recognizing construction crafts apprenticeship as a formal pathway equivalent to institutional TVET, with clear progression routes to certification; introduction of incentives such as tax rebates for employers hosting apprentices, subsidies for tools/materials, and stipends for apprentices; establishment of national competency standards and certification aligned with industry needs; creation of a dedicated regulatory body or strengthened role for existing agencies such as NBTE and ITF to accredit training sites, monitor quality, and prevent exploitation.

Pillar 2: Institutional and Partnership Architecture

This pillar emphasizes collaborative governance and capacity building among stakeholders. Some core elements include the formation of tripartite Sector Skills Councils or strengthening existing ones involving government, professional associations, trade unions and training providers. Accreditation and capacity-building programmes for master craftsmen, including short courses on modern techniques, pedagogy, safety, and mentorship. Development of intermediary organizations to match apprentices with suitable employers, broker partnerships and provide support services. Public-private partnerships (PPPs) for funding, infrastructure sharing, and joint programme delivery. Establishment of model apprenticeship centers in key construction hubs such as in Abuja and Lagos as demonstration sites.

Pillar 3: Curriculum and Delivery System

This pillar focuses on a structured, hybrid, competency-based training model that balances workplace engagement with structured instruction model. The main features include the hybrid delivery model where 70–80% of the programme is devoted to on-the-job training under supervision; 20–30% related instruction covering theory, mathematics, technical drawing, safety, sustainability and emerging topics. Incorporating modular, progressive structure with clear stages such as foundation (basic tasks), intermediate (independent work under guidance), and advanced (full competence, including supervision of juniors). The use of competency-based assessment using observable performance criteria, portfolios, practical tests, and workplace observations. Incorporation of soft skills (e.g., communication, entrepreneurship, financial literacy) and emerging competencies (e.g., green building practices, basic digital tools for site management).

Pillar 4: Support and Inclusivity Mechanisms

This pillar addresses recruitment, retention, equity, and sustainability. The essential components include the national and targeted social marketing campaigns to reposition construction crafts as respectable, rewarding careers. Financial support provision through stipends, tool allowances, health/safety insurance, and micro-finance for post-apprenticeship start-up. Targeted recruitment of underrepresented groups (women, disadvantaged youth, IDPs) through scholarships, safe training environments, and gender-sensitive policies. Mentorship and pastoral support systems, including career guidance and progression pathways. Continuous monitoring, evaluation, and feedback loops involving regular stakeholder reviews and tracer studies of graduates.

The framework operates as an adaptive system, with external drivers (technological change, economic conditions, policy shifts) feeding into regular reviews. At its core remains the apprentice-master relationship, enhanced by structured support to ensure high-quality, sustainable outcomes.

Theoretical Contributions

This study makes significant theoretical contributions to the body of knowledge in technical and vocational education and training (TVET), particularly in the domain of construction crafts apprenticeship within developing economies such a Nigeria. The study successfully integrates and extends key Western learning theories, especially the Lave and Wenger's (1991) situated learning theory, the cognitive apprenticeship model of Collins, Brown and Newman (1989), and competency-based training principles into a unified, contextually relevant framework for apprenticeship revitalization. By conceptualizing construction crafts apprenticeship as a dynamic community of practice deeply rooted in real-life production activities, the framework illuminates the critical interplay between tacit knowledge transmission, embodied skills, spatial reasoning, and risk-laden workplace learning. These elements, which are particularly pronounced in construction trades, have often been inadequately addressed in conventional TVET literature. This integration represents a novel theoretical synthesis that enriches our understanding of how craft skills are best acquired in the unique environment of the construction industry.

The study advances a multi-level, systems-oriented approach that effectively bridges the strengths of traditional informal apprenticeship systems that is so deeply embedded in Nigerian and African socio-cultural heritage (Ekekwe, 2017)with contemporary requirements such as structured quality assurance, inclusivity, and responsiveness to technological advancements. This hybrid conceptualization moves beyond the limitations of both purely traditional time-served models and overly formal institutionalized approaches that have dominated TVET policy in many developing countries. It therefore contributes a fresh theoretical blueprint for modernizing apprenticeship systems without discarding their cultural and practical essence.

The developed framework extends stakeholder theory (Freeman, 1984) and human capital theory (Becker, 1964) by placing strong emphasis on tripartite and multi-stakeholder collaboration. It positions the revitalization of construction crafts apprenticeship as a shared national responsibility involving government agencies, industry operators, master craftsmen, training institutions, trade unions, and the wider community. This perspective is particularly relevant in jurisdictions like Nigeria, where fragmented efforts have continued to undermine skills development initiatives.

Taken together, this study provides a contextually grounded theoretical view for understanding not only the decline of apprenticeship systems but also practical path for their revival especially in developing countries. The study moves beyond the usual diagnosis of problems that characterizes much of existing TVET scholarship in Africa to offer a specialized, sector-specific framework tailored to the peculiarities of the construction industry. This represents a modest but important addition to the growing body of indigenous scholarship seeking to decolonize and contextualize skills development theories in the Nigerian.

Implications for Practice

The validated framework offers actionable guidance for revitalizing construction crafts apprenticeship programmes in Nigeria. It can also be modeled by other developing countries facing shortage of skilled workers and youth unemployment. For policymakers and regulatory bodies, the framework supports the development of enabling legislation, national competency standards, incentives and accreditation mechanisms to formalize and protect apprenticeships

while recognizing prior informal learning. This aligns with ongoing Nigerian TVET reforms and can help bridge the gap between policy intent and implementation.

Industry practitioners could benefit from clear strategies for partnership building, and hybrid delivery models. This could improve craft quality, reduce defects, enhance international competitiveness, and address the skills gap through structured youth recruitment and progression pathways. The framework can serve as blueprint to training providers for modular, competency-based curricula that integrate emerging competencies while preserving authentic workplace engagement. The emphasis on inclusivity through targeted recruitment of women and disadvantaged groups, stipends and social marketing offers practical tools to improve the sector's image and broaden participation.

At the broader societal level, successful revitalization could contribute to economic upliftment, reduced youth unemployment, enhanced work-integrated learning in line with Sustainable Development Goal 8 by producing a competent, employable craftsmen.

Conclusion, Limitations, and Directions for Future Research

This study provides a robust and empirically validated framework that can guide the revival of construction crafts apprenticeship programmes. By addressing longstanding systemic weaknesses while building on traditional strengths, it offers a pathway toward a more skilled, inclusive, and sustainable construction workers in Nigeria. Implementation efforts, supported by ongoing research, hold significant promise for transforming the sector and contributing to broader socio-economic development of the country.

Despite its contributions, the study has several limitations that should be acknowledged. For instance, the research primarily draws its data from Nigeria. This may limit the generalizability of the result to other developing countries with different socio-economic, cultural, and regulatory contexts. While the framework is designed with adaptability in mind, cross-national applicability requires further testing. The modest sample sizes in the qualitative interviews though purposively selected (n=10), Delphi panel (n=18) and workshops (n=42), may pose some limitations. This is due to the fact that, broader quantitative validation across larger populations of apprentices, employers, and graduates was beyond the scope of this exploratory study.

The framework development and validation relied heavily on expert consensus and stakeholder feedback rather than long-term longitudinal implementation data. Therefore, the actual outcomes such as completion rates, skill acquisition, employment impacts remain to be empirically tested. The study was conducted prior to full-scale adoption of recent Nigerian TVET policy shifts, so evolving national reforms may influence framework relevance.

Based on the limitations identified in the preceding paragraphs, the following directions for future inquiry can be extracted from this work. Longitudinal evaluation to assess real-world impacts on apprentice completion rates, skill competency, employment outcomes, craft quality and economic returns can be explored. Comparative studies applying or adapting the framework in other developing countries to examine contextual variations and transferability can be pursued.

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