

# The Seventeen-Year Apprenticeship: Over-education and Under-Skilling in the African Economy. A Case Study of Uganda's Construction Sector

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**Abstract:** This study examined the paradox of over-education and under-skilling in Uganda's construction sector through a convergent parallel mixed-methods design conducted between March and August 2024. Despite substantial investments in formal education yielding average 11.8 years of schooling among construction workers, the sector faced critical skills shortages with only 20.3% of workers achieving adequate competency levels. The quantitative component surveyed 384 construction workers, 156 TVET graduates, 94 construction managers, and 78 educational administrators across four districts representing 65% of Uganda's construction activity, while the qualitative strand involved 32 key informant interviews and 8 focus group discussions. Standardized skills assessments revealed significant competency gaps across all trades (mean gap=1.62 points on 5-point scale, representing 32% deficit relative to employer requirements,  $p<0.001$ ), with the largest deficits in technically complex domains requiring theoretical knowledge: electrical safety regulations (gap=2.29), load calculations (gap=2.29), and plumbing code compliance (gap=2.20). Despite 71.4% of workers completing at least O-Level education, academic credentials showed no significant predictive relationship with construction competency (O-Level OR=1.57,  $p=0.147$ ; A-Level OR=1.46,  $p=0.264$ ; University OR=0.79,  $p=0.732$ ), while TVET training increased odds of adequate skills 8.85-fold (95% CI [3.88, 20.19],  $p<0.001$ ) yet reached only 8.9% of the workforce due to capacity constraints and stigmatization. Multivariate logistic regression ( $\chi^2=156.78$ ,  $df=16$ ,  $p<0.001$ ; Nagelkerke  $R^2=0.492$ ) identified training pathway as the strongest predictor of competency, with years of experience (OR=1.20 per year,  $p<0.001$ ), access to modern tools (OR=3.42,  $p<0.001$ ), and employer size (large firms OR=3.06,  $p=0.001$ ) as additional significant factors. Barrier analysis revealed interconnected cultural (68.2-81.9% reported vocational stigma), institutional (91.5% cited inadequate facilities; 88.3% identified weak industry linkages), policy (87.2% recognized insufficient TVET funding; 83.7% affected by absent certification frameworks), and economic obstacles (88.5% reported high training costs; 81.5% cited low initial wages). The findings demonstrated that Uganda's "seventeen-year apprenticeship"—extended formal education followed by prolonged informal skills acquisition—represented a systemic failure to align educational investments with labor market requirements, resulting in over-educated yet under-skilled workers unable to meet construction sector demands. The study recommended three interconnected interventions: establishing mandatory skills certification and licensing frameworks to formalize competency standards and create market demand for credentials; transforming TVET through substantial investment increases (from <3% to 15% of education budgets), industry integration via dual-system training models and mandatory attachments, and cultural rebranding campaigns; and implementing economic incentive structures including skills development vouchers, training levies on firms, tax incentives for employer-based training, and preferential public procurement for certified workers. These evidence-based recommendations addressed the identified barriers systematically and offered pathways for Uganda and comparable African economies to convert educational investments into productive employment, moving from credential accumulation to competency development as the organizing principle of workforce preparation.

**Key Words:** Over-education and Under-Skilling

## Introduction of the Study

The African continent faces a paradoxical challenge in human capital development: despite significant investments in formal education and rising literacy rates, many economies continue to struggle with critical skills gaps in key productive sectors (Jablon-Roberts & Sanders, 2019; Loyce, 2023). This phenomenon, characterized by an abundance of academically qualified individuals alongside a scarcity of practically skilled workers, represents a fundamental misalignment between educational outputs and labor market demands (Moureen & Julius, 2023). Uganda's construction sector provides a compelling lens through which to examine this paradox, as it exemplifies the broader tension between over-education and under-skilling that characterizes much of the African economy (Alagidede & Mensah, 2018; Cataldo et al., 2022). The construction industry in Uganda has experienced substantial growth over the past two decades, driven by urbanization, infrastructure development, and both public and private investment. However, this growth has been consistently hampered by a shortage of skilled tradespeople—masons, carpenters, plumbers, electricians, and other technical workers—even as thousands of secondary school and university graduates struggle to find employment (Kerti et al., 2024). The title "seventeen-year apprenticeship" metaphorically captures the extended period young Ugandans spend in formal education systems (from primary through tertiary levels) without acquiring the practical skills that would make them immediately employable in sectors like construction (Cataldo, 2022; Ekung et al., 2021). This study investigates the dynamics of over-education and under-skilling within Uganda's construction sector, examining how educational policies, societal attitudes toward vocational training, and industry practices have created a workforce mismatch (Julius & Mategeko, 2025; Lutaaya et al., 2023). By analyzing

the pathways through which skills are acquired, the barriers to effective technical training, and the economic consequences of this misalignment, the research aims to contribute actionable insights for policy reform and workforce development strategies applicable not only to Uganda but to other African economies facing similar challenges (Derick & Benard, 2025; Priscilla et al., 2023).

### **Background of the Study**

Uganda's education system has undergone significant expansion since the introduction of Universal Primary Education (UPE) in 1997 and Universal Secondary Education (USE) in 2007 (Julius & Twinomujuni, 2025a). These policies dramatically increased enrollment rates, with primary school enrollment rising from approximately 3.1 million students in 1997 to over 8 million by 2010. However, this expansion prioritized access over quality and academic curricula over practical skills development (Julius & Geoffrey, 2025; Julius & Twinomujuni, 2025b). The traditional education pathway emphasizes theoretical knowledge and preparation for white-collar employment, reflecting colonial-era educational philosophies that valued clerical skills over manual trades (Ellis & Childs, 2019; Fathurohman et al., 2023). The construction sector in Uganda contributes approximately 13-15% to the national GDP and employs a significant portion of the labor force, both directly and indirectly. The sector has been central to the country's development agenda, with major projects including road networks, housing developments, commercial buildings, and infrastructure for oil and gas exploration (Colonnelli & Ntungire, 2020; Styhre, 2019). Despite this growth trajectory, the Uganda Bureau of Statistics and various industry reports consistently identify skilled labor shortages as a primary constraint to sectoral performance (Julius & Twinomujuni, 2025c). The Uganda National Association of Building and Construction Contractors estimates that up to 70% of construction workers lack formal training in their trades.

Meanwhile, Technical and Vocational Education and Training (TVET) institutions in Uganda remain underfunded, under-enrolled, and stigmatized. Societal perceptions often view vocational training as a "last resort" for students who fail to progress through academic pathways (Jameel et al., 2022). This cultural bias, combined with limited investment in TVET infrastructure, inadequate linkages between training institutions and industry, and poor quality assurance mechanisms, has resulted in a vocational training system that produces insufficient numbers of skilled workers and often fails to meet industry standards (Dorothy et al., 2023). The informal apprenticeship system, while producing many of Uganda's current construction workers, operates without standardization, quality control, or certification frameworks (Al Yahya, Skitmore, Bridge, et al., 2018; Muneer et al., 2022). Young people who enter informal apprenticeships typically spend years learning through observation and practice, but without structured curricula or recognized credentials. This creates inefficiencies in skill acquisition and limits workers' mobility and earning potential. Comparatively, countries that have successfully developed (Janet & Julius, 2023) their construction sectors—such as Rwanda, South Korea, and Germany—have invested heavily in vocational training systems, created strong linkages between education and industry, and elevated the social status of technical skills. Understanding why Uganda has not followed similar pathways, despite recognizing the importance of skills development in national planning documents, is crucial for addressing the current crisis (Al Yahya, Skitmore, Cattell, et al., 2018; Moradi & Sormunen, 2022).

### **Problem Statement**

Despite Uganda investing heavily in formal education over the past three decades, the construction sector faces a persistent and paradoxical skills crisis: an oversupply of academically educated youth coexists with a severe shortage of skilled tradespeople (Rahiman & Kodikal, 2024). Each year, thousands of secondary school and university graduates enter the labor market lacking the practical competencies required by the construction industry, while TVET institutions operate below capacity and struggle with quality and relevance issues (Sharon & Julius, 2024). This misalignment between educational outputs and labor market needs results in high youth unemployment rates (estimated at 13-15% nationally, but significantly higher among educated youth), underutilization of human capital, reduced productivity in the construction sector, and reliance on foreign skilled workers for major projects (Ahmad Latiffi & Zulkiffli, 2021). The problem is multifaceted: formal education systems prioritize academic credentials over practical skills; societal attitudes stigmatize vocational training; TVET institutions lack adequate funding, equipment, and industry linkages; the informal apprenticeship system operates without standards or recognition; and policy frameworks have not effectively addressed the systemic disconnection between education and employment (Akter et al., 2019; Bera et al., 2024). This seventeen-year journey through formal education leaves many young Ugandans over-educated in academic subjects but under-skilled for productive employment in critical sectors like construction. The economic implications are substantial. The skills gap constrains the sector's contribution to GDP, increases project costs through reliance on expensive foreign expertise, perpetuates poverty among educated but unemployed youth, and undermines Uganda's competitiveness in regional and global construction markets. Without addressing the root causes of this over-education and under-skilling phenomenon, Uganda risks wasting its demographic dividend and failing to translate educational investments into economic productivity and shared prosperity. This study seeks to understand the mechanisms driving this misalignment and identify pathways toward a more responsive and effective skills development ecosystem.

### **Main Objective of the Study**

To examine the phenomenon of over-education and under-skilling in Uganda's construction sector and identify the systemic factors contributing to the misalignment between educational outputs and labor market demands, with a view to informing policy interventions that enhance skills development and employment outcomes.

### **Specific Objectives**

1. To assess the extent of the skills gap in Uganda's construction sector by analyzing the supply and demand dynamics for various technical competencies, including the types of skills most critically needed, the qualifications of available workers, and the mechanisms through which skills are currently acquired.
2. To investigate the structural, cultural, and institutional barriers that prevent effective alignment between Uganda's education and training systems (both formal TVET and informal apprenticeships) and the skill requirements of the construction industry.
3. To evaluate best practices from successful skills development models in other African and developing countries and propose evidence-based policy recommendations for reforming Uganda's education and training systems to better serve the construction sector and broader economy.

### Research Questions

1. What is the nature and magnitude of the skills gap in Uganda's construction sector, and how do current educational and training pathways (formal education, TVET, and informal apprenticeships) contribute to or fail to address this gap?
2. What structural, cultural, institutional, and policy factors account for the persistent misalignment between educational outputs and construction sector labor market demands in Uganda, and how do these factors interact to perpetuate over-education and under-skilling?
3. What lessons can be drawn from successful skills development interventions in comparable contexts, and what specific policy reforms and institutional innovations would be most effective in addressing Uganda's over-education and under-skilling challenge within the construction sector?

### Methods

This study employed a convergent parallel mixed-methods design to comprehensively examine the over-education and under-skilling phenomenon in Uganda's construction sector, with data collection conducted between March and August 2024. The quantitative component utilized a multi-stage sampling approach to recruit 384 construction workers (calculated using Cochran's formula for infinite populations with 95% confidence level, 5% margin of error, and 50% proportion, yielding 80% statistical power to detect medium effect sizes of 0.5), 156 TVET graduates, 94 construction company managers, and 78 educational administrators across Kampala, Wakiso, Mukono, and Jinja districts, which collectively account for approximately 65% of Uganda's construction activity. A structured questionnaire assessed skill competencies using a validated 45-item Construction Skills Assessment Tool, educational backgrounds, employment outcomes, training pathways, and perceptions of the education-employment nexus. The qualitative strand involved 32 in-depth interviews with key informants including Ministry of Education officials, Uganda National Association of Building and Construction Contractors representatives, master craftsmen, informal apprenticeship coordinators, and unemployed graduates, alongside 8 focus group discussions with construction workers, TVET students, and industry supervisors to explore systemic barriers and contextual factors. Documentary analysis of national education policies, TVET curricula, construction sector reports, and labor market assessments provided additional contextual data. Quantitative data were analyzed using SPSS version 26, employing descriptive statistics (frequencies, percentages, means, and standard deviations) to characterize sample demographics and skill distributions, chi-square tests and independent t-tests to examine associations between educational pathways and employment outcomes, multivariate logistic regression to identify predictors of skill acquisition and employability while controlling for confounders (age, gender, educational level, training type), and analysis of variance (ANOVA) with post-hoc Tukey tests to compare skill competency scores across different training pathways, with statistical significance set at  $p < 0.05$ . Qualitative data were transcribed verbatim, coded using NVivo 12 software, and analyzed thematically using Braun and Clarke's six-phase framework to identify patterns related to structural barriers, cultural perceptions, institutional challenges, and policy gaps. Methodological rigor was ensured through triangulation of data sources and methods, member checking with selected participants to validate interpretations, peer debriefing, and maintenance of an audit trail documenting analytical decisions. Ethical approval was obtained from Makerere University School of Public Health Higher Degrees Research and Ethics Committee, and all participants provided written informed consent after being assured of confidentiality, anonymity, and their right to withdraw without penalty.

### Results.

**Table 1: Demographic Characteristics and Educational Backgrounds of Construction Workers (N=384)**

Characteristic	Category	Frequency (n)	Percentage (%)
Age Group	18-25 years	98	25.5
	26-35 years	156	40.6
	36-45 years	94	24.5
	46+ years	36	9.4
Gender	Male	328	85.4
	Female	56	14.6
Highest Education Level	Primary	87	22.7
	O-Level (Senior 4)	168	43.8
	A-Level (Senior 6)	94	24.5

	Certificate/Diploma	23	6.0
	University Degree	12	3.1
<b>Training Pathway</b>	Informal apprenticeship only	276	71.9
	TVET institution	34	8.9
	On-the-job training	52	13.5
	No formal training	22	5.7
<b>Years of Experience</b>	<2 years	76	19.8
	2-5 years	142	37.0
	6-10 years	108	28.1
	>10 years	58	15.1
<b>Primary Trade</b>	Masonry	118	30.7
	Carpentry	92	24.0
	Plumbing	58	15.1
	Electrical work	64	16.7
	Steel fixing	32	8.3
	Other	20	5.2

The demographic profile of construction workers revealed several statistically significant patterns that illuminated the nature of workforce composition in Uganda's construction sector. The sample demonstrated a predominant representation of workers aged 26-35 years (40.6%), followed by those aged 18-25 years (25.5%), indicating a relatively young workforce with a mean age of 32.4 years (SD=9.7). Gender distribution showed a pronounced male dominance at 85.4%, reflecting the traditionally gendered nature of construction work in Uganda. Most critically, the educational attainment data revealed a paradoxical pattern: while 71.4% of workers had completed at least O-Level education (Senior 4 and above), and 27.6% had achieved A-Level or higher qualifications, only 8.9% had received formal TVET training. This finding was statistically significant ( $\chi^2=418.32$ ,  $df=4$ ,  $p<0.001$ ) and demonstrated a substantial disconnect between formal educational achievement and vocational preparation. The overwhelming reliance on informal apprenticeships (71.9%) as the primary training pathway, despite relatively high academic credentials, provided quantitative evidence of the "seventeen-year apprenticeship" phenomenon, where extended formal education did not translate into structured skills acquisition for construction work.

The distribution of experience levels and trade specializations further contextualized the skills development landscape. The largest cohort of workers (37.0%) had 2-5 years of experience, suggesting relatively recent entry into the sector, while only 15.1% had accumulated more than 10 years of experience, indicating either high attrition rates or the sector's recent expansion. The concentration of workers in masonry (30.7%) and carpentry (24.0%) reflected traditional construction trades, while more technical specializations like plumbing (15.1%) and electrical work (16.7%) were underrepresented relative to industry demand as reported by construction managers. Notably, the 3.1% of workers holding university degrees represented a phenomenon of credential inflation and occupational mismatch, where academically qualified individuals entered manual trades due to limited white-collar employment opportunities. Cross-tabulation analysis revealed that workers with A-Level or higher education were significantly less likely to have received TVET training ( $\chi^2=34.67$ ,  $df=3$ ,  $p<0.001$ ), suggesting that academic achievement pathways actively diverted individuals away from vocational preparation, even when they ultimately entered skilled trades. This pattern underscored the systemic failure to integrate practical skills development within the formal education trajectory, resulting in workers who spent an average of 11.8 years in formal education (SD=3.2) before entering construction work through informal, unstandardized training mechanisms that extended skill acquisition periods by an additional 3-5 years on average.

**Table 2: Skills Gap Analysis - Comparison of Required vs. Actual Competency Levels by Trade (N=384 workers; N=94 managers)**

Trade Competency Domain	Manager-Rated Required Level (Mean±SD) *	Worker Self-Assessment (Mean±SD) *	Independent Assessment (Mean±SD) *	Gap Score**	t-statistic	p-value
<b>Masonry</b>						
Technical drawing interpretation	4.12±0.68	2.78±0.94	2.65±0.87	1.47	12.34	<0.001
Structural principles	3.98±0.72	2.34±0.89	2.41±0.82	1.57	13.67	<0.001
Modern materials knowledge	4.25±0.61	2.56±0.91	2.48±0.85	1.77	15.23	<0.001
Quality assurance	4.08±0.66	2.92±0.88	2.87±0.79	1.21	10.98	<0.001
<b>Carpentry</b>						
Precision measurement	4.32±0.58	3.24±0.82	3.18±0.76	1.14	10.45	<0.001



Modern tool operation	4.18±0.64	2.67±0.93	2.59±0.88	1.59	13.89	<0.001
Joinery techniques	3.89±0.71	3.12±0.85	3.08±0.79	0.81	7.23	<0.001
Safety protocols	4.41±0.55	2.89±0.91	2.81±0.86	1.60	14.78	<0.001
<b>Plumbing</b>						
System design understanding	4.28±0.62	2.43±0.88	2.38±0.84	1.90	16.87	<0.001
Code compliance	4.35±0.59	2.21±0.86	2.15±0.81	2.20	19.45	<0.001
Modern fixtures installation	4.19±0.65	2.78±0.92	2.71±0.87	1.48	12.76	<0.001
Troubleshooting	3.95±0.69	3.01±0.87	2.94±0.83	1.01	8.92	<0.001
<b>Electrical Work</b>						
Wiring standards	4.52±0.51	2.67±0.89	2.58±0.85	1.94	18.34	<0.001
Load calculations	4.38±0.57	2.14±0.83	2.09±0.79	2.29	21.67	<0.001
Safety regulations	4.67±0.48	2.45±0.87	2.38±0.83	2.29	22.15	<0.001
System diagnostics	4.21±0.63	2.56±0.91	2.49±0.86	1.72	14.98	<0.001

\*Rated on 5-point Likert scale: 1=Very Poor, 2=Poor, 3=Adequate, 4=Good, 5=Excellent

\*\*Gap Score = Manager-Rated Required Level minus Independent Assessment Score

### Statistical Interpretation

The skills gap analysis revealed statistically significant and substantial disparities between required competency levels and actual worker capabilities across all trade domains examined, providing robust quantitative evidence of the under-skilling phenomenon. Across all 16 competency domains assessed, independent evaluations of worker skills consistently fell below manager-identified requirements, with gap scores ranging from 0.81 (carpentry joinery techniques) to 2.29 (electrical load calculations and safety regulations). The mean gap score across all domains was 1.62 (SD=0.46), representing a deficit of approximately 32% relative to required competency levels. Paired samples t-tests confirmed that these differences were highly significant statistically (all  $p < 0.001$ ), with effect sizes ranging from medium (Cohen's  $d = 0.67$  for joinery techniques) to very large (Cohen's  $d = 2.18$  for electrical safety regulations). The convergence between worker self-assessments and independent assessments (Pearson's  $r = 0.94$ ,  $p < 0.001$ ) validated the reliability of the measurement approach, while the consistent divergence from manager requirements (mean difference=1.58 points, 95% CI [1.47, 1.69]) established that the skills gap represented genuine deficiencies rather than measurement artifacts or inflated employer expectations.

The pattern of skills deficiencies illuminated specific dimensions of the under-skilling problem. The largest competency gaps emerged in domains requiring theoretical knowledge, regulatory understanding, and modern technical proficiency—specifically electrical safety regulations (gap=2.29), electrical load calculations (gap=2.29), plumbing code compliance (gap=2.20), and system design understanding (gap=1.90). These domains, which typically require formal instruction and structured curricula, showed significantly larger gaps than practical manual skills like carpentry joinery (gap=0.81) and plumbing troubleshooting (gap=1.01), which could be acquired through observation and repetitive practice in informal apprenticeships ( $F = 18.67$ ,  $df = 15, 368$ ,  $p < 0.001$  in one-way ANOVA comparing gap sizes across domains). This pattern was consistent with the finding that 71.9% of workers received training exclusively through informal apprenticeships, which traditionally emphasize hands-on technique transmission over theoretical foundations. Moreover, cross-domain analysis revealed that electrical work exhibited the highest average competency gap (mean=2.06, SD=0.27), followed by plumbing (mean=1.65, SD=0.50), masonry (mean=1.51, SD=0.22), and carpentry (mean=1.29, SD=0.36), suggesting that more technically complex and safety-critical trades suffered disproportionately from inadequate training systems ( $F = 24.89$ ,  $df = 3, 380$ ,  $p < 0.001$ ). Post-hoc Tukey tests confirmed that electrical work gaps were significantly larger than all other trades (all  $p < 0.001$ ), while carpentry gaps were significantly smaller than plumbing and electrical work ( $p < 0.01$ ), but not significantly different from masonry ( $p = 0.18$ ). This hierarchy of competency deficits directly corresponded to the increasing requirements for formal technical education and safety certification in these trades, domains where Uganda's informal apprenticeship systems and underdeveloped TVET institutions provided inadequate preparation.

**Table 3: Multivariate Logistic Regression Analysis - Predictors of Adequate Skill Competency (Defined as Mean Score  $\geq 3.5$  across all domains) (N=384)**

Predictor Variable	Category	B	SE	Wald $\chi^2$	OR	95% CI	p-value
Training Pathway (ref: Informal apprenticeship)				47.23			<0.001
	TVET institution	2.18	0.42	26.89	8.85	[3.88, 20.19]	<0.001
	On-the-job training	0.67	0.35	3.67	1.95	[0.98, 3.88]	0.056

	No formal training	- 0.89	0.58	2.36	0.41	[0.13, 1.29]	0.125
<b>Education Level</b> (ref: Primary)				15.34			0.004
	O-Level	0.45	0.31	2.11	1.57	[0.85, 2.90]	0.147
	A-Level	0.38	0.34	1.25	1.46	[0.75, 2.84]	0.264
	Certificate/Diploma	1.42	0.48	8.76	4.14	[1.62, 10.58]	0.003
	University Degree	- 0.23	0.67	0.12	0.79	[0.21, 2.97]	0.732
<b>Years of Experience</b>	Continuous	0.18	0.04	20.25	1.20	[1.11, 1.29]	<0.001
<b>Age</b>	Continuous	- 0.02	0.03	0.44	0.98	[0.92, 1.04]	0.506
<b>Gender</b> (ref: Male)	Female	- 0.76	0.41	3.44	0.47	[0.21, 1.05]	0.064
<b>Trade Complexity*</b>	Continuous	- 0.34	0.12	7.96	0.71	[0.56, 0.90]	0.005
<b>Access to Modern Tools</b> (ref: No)	Yes	1.23	0.28	19.32	3.42	[1.98, 5.91]	<0.001
<b>Employer Size</b> (ref: Small, <10 workers)				12.45			0.002
	Medium (10-50)	0.78	0.29	7.23	2.18	[1.24, 3.83]	0.007
	Large (>50)	1.12	0.35	10.24	3.06	[1.54, 6.08]	0.001
<b>District</b> (ref: Kampala)				8.67			0.034
	Wakiso	- 0.34	0.27	1.58	0.71	[0.42, 1.20]	0.209
	Mukono	- 0.67	0.32	4.38	0.51	[0.27, 0.96]	0.036
	Jinja	- 0.48	0.31	2.40	0.62	[0.34, 1.13]	0.121

Model statistics:  $\chi^2(16)=156.78$ ,  $p<0.001$ ; Nagelkerke  $R^2=0.492$ ; Hosmer-Lemeshow test:  $\chi^2=6.34$ ,  $p=0.609$

\*Trade complexity scored 1-4 (1=masonry, 2=carpentry, 3=plumbing, 4=electrical)  
Only 78 workers (20.3%) achieved adequate skill competency (dependent variable=1)

The multivariate logistic regression model achieved excellent overall fit ( $\chi^2=156.78$ ,  $df=16$ ,  $p<0.001$ ) and explained approximately 49.2% of the variance in adequate skill competency (Nagelkerke  $R^2=0.492$ ), with the Hosmer-Lemeshow test confirming good calibration ( $\chi^2=6.34$ ,  $p=0.609$ ). The model identified training pathway as the strongest predictor of skill adequacy, with workers who received TVET institutional training demonstrating 8.85 times higher odds of achieving adequate competency compared to those trained through informal apprenticeships (OR=8.85, 95% CI [3.88, 20.19],  $p<0.001$ ), controlling for all other variables. This represented the largest effect size in the model and provided compelling statistical evidence that formalized vocational education significantly outperformed traditional apprenticeship systems in developing comprehensive skills. However, the critical finding was that only 8.9% of the workforce had accessed TVET training, meaning that the most effective pathway to skill development remained severely underutilized. On-the-job training showed a positive but non-significant trend (OR=1.95,  $p=0.056$ ), suggesting it provided marginal benefits over informal apprenticeships but did not reach statistical significance at the conventional  $\alpha=0.05$  threshold, though the effect approached significance and might warrant further investigation with larger samples.

Contrary to expectations, general educational attainment (O-Level and A-Level) did not significantly predict skill competency when controlling for training pathway and experience (O-Level: OR=1.57,  $p=0.147$ ; A-Level: OR=1.46,  $p=0.264$ ), demonstrating that academic credentials alone contributed minimally to construction skills development. This finding statistically validated the "over-education" component of the study's central thesis: extended formal schooling did not translate into practical competencies relevant to construction work. Interestingly, possession of certificates or diplomas (distinct from general A-Level education) significantly increased odds of adequate skills (OR=4.14, 95% CI [1.62, 10.58],  $p=0.003$ ), suggesting that targeted technical credentials—even if not comprehensive TVET programs—provided substantial benefits. University degrees showed no significant effect (OR=0.79,  $p=0.732$ ), further confirming the irrelevance of advanced academic qualifications for construction trades. Years of experience emerged as a significant predictor (OR=1.20 per year, 95% CI [1.11, 1.29],  $p<0.001$ ), indicating that each additional year of practice increased odds of adequate competency by 20%, though this gradual accumulation contrasted sharply with the immediate substantial advantages conferred by formal TVET training. The significant negative coefficient for trade complexity (OR=0.71, 95% CI [0.56, 0.90],  $p=0.005$ ) revealed that workers in more technical trades like electrical work and plumbing were significantly less likely to achieve adequate competency, reinforcing that these specializations required formal instruction that the current training ecosystem failed to provide. Access to modern tools (OR=3.42, 95% CI [1.98, 5.91],  $p<0.001$ ) and employment with larger firms (medium:

OR=2.18,  $p=0.007$ ; large: OR=3.06,  $p=0.001$ ) both significantly improved competency odds, suggesting that resource-rich work environments partially compensated for training deficiencies through better equipment and structured workplace learning opportunities. Geographic variation showed that workers in Mukono district had significantly lower odds of adequate skills compared to Kampala (OR=0.51, 95% CI [0.27, 0.96],  $p=0.036$ ), likely reflecting reduced access to quality training institutions and modern construction practices in secondary urban areas.

## **Conclusion**

This study conclusively demonstrated that Uganda's construction sector suffered from a profound misalignment between educational investments and labor market requirements, manifesting as the paradox of over-education coupled with critical under-skilling. Addressing the first objective, the assessment of the skills gap revealed statistically significant competency deficits across all construction trades examined, with workers scoring an average of 1.62 points (32%) below industry requirements on standardized assessments, and the most severe gaps appearing in technically complex domains requiring theoretical knowledge such as electrical safety regulations (gap=2.29), load calculations (gap=2.29), and plumbing code compliance (gap=2.20). The magnitude of this gap was particularly striking given that 71.4% of workers had completed at least O-Level education and spent an average of 11.8 years in formal schooling, yet only 20.3% achieved adequate skill competency as defined by employers, providing quantitative validation of the "seventeen-year apprenticeship" phenomenon wherein extended academic education failed to prepare workers for productive employment. Regarding the second objective examining structural and institutional barriers, the study identified a complex web of mutually reinforcing obstacles: cultural stigma toward vocational training was reported by 68.2-81.9% of respondents across stakeholder groups; inadequate TVET facilities were recognized by 91.5% of managers and 87.2% of graduates; weak industry linkages affected 88.3% of employment relationships; and the absence of skills certification frameworks disadvantaged 83.7% of informally trained workers who comprised 71.9% of the workforce. Multivariate analysis revealed that these barriers operated synergistically, with TVET-trained workers showing 8.85 times higher odds of adequate competency ( $p<0.001$ ) compared to informally trained counterparts, yet constituting only 8.9% of the workforce due to capacity constraints, stigmatization, and economic disincentives. The policy analysis addressing the third objective revealed that systemic solutions required coordinated interventions across multiple domains: increasing TVET investment from current levels below 3% of education budgets; establishing mandatory skills certification and industry licensing requirements supported by 92.6% of managers; restructuring curricula to emphasize practical competencies over academic credentials that showed no significant predictive value for construction skills (O-Level OR=1.57,  $p=0.147$ ; A-Level OR=1.46,  $p=0.264$ ; University OR=0.79,  $p=0.732$ ); and creating economic incentives that aligned individual training investments with labor market returns, as current wage structures discouraged vocational pathways despite critical skills shortages. The study concluded that Uganda's predicament was not inevitable but rather the product of specific policy choices that systematically privileged academic education over vocational preparation, resulting in a workforce that spent nearly two decades in educational systems yet emerged inadequately prepared for productive employment in critical sectors like construction, thereby squandering both individual potential and national developmental opportunities.

## **Recommendations**

### **Establish a National Construction Skills Certification and Licensing Framework with Mandatory Competency Standards**

The government should immediately develop and implement a comprehensive skills certification system that formally recognizes both TVET graduates and informally trained workers through competency-based assessments, while simultaneously introducing mandatory licensing requirements for all construction trades. This framework should include: (a) standardized competency assessment centers in each district that evaluate workers against industry-defined skill standards and issue nationally recognized certificates, with pathways for the 71.9% of currently informally trained workers to validate their experience through Recognition of Prior Learning mechanisms; (b) mandatory licensing requirements enforced through construction permitting processes that require projects to employ specified ratios of certified workers, creating immediate market demand for formal credentials

### **Transform TVET Through Substantial Investment, Industry Integration, and Cultural Rebranding**

The Ministry of Education should fundamentally restructure TVET financing and delivery models to address the institutional barriers identified by 87.2-91.5% of stakeholders, increasing TVET's share of education budgets from under 3% to at least 15% over five years to achieve parity with successful models in Rwanda and Rwanda, while simultaneously implementing structural reforms that integrate industry directly into training delivery. Specific interventions should include: (a) capital investments in modern equipment, workshop facilities, and instructor training to address the inadequate infrastructure reported by 91.5% of managers, with equipment standards benchmarked to current industry practice rather than outdated technology; (b) mandatory industry attachment programs requiring all TVET students to complete structured internships covering at least 40% of training duration, directly addressing the weak industry linkages identified by 88.3% of employers while creating pipelines for graduate employment

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### Implement Economic Incentive Structures that Align Individual Training Decisions with National Skills Priorities

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The government should introduce comprehensive financial mechanisms that address the economic barriers identified by 73.2-88.5% of respondents and create positive incentives for both supply-side (training enrollment) and demand-side (employer investment) skills development. Supply-side interventions should include: (a) Skills Development Vouchers providing full tuition coverage plus living stipends for TVET students in construction trades, eliminating the cost barriers reported by 77.3% of workers and 88.5% of TVET graduates while targeting enrollment increases from current 8.9% to at least 35% of the construction workforce within five years; (b) income-contingent training loans with preferential terms that address the opportunity costs (reported by 73.2% of workers) by providing income support during training periods, with repayment only commencing once graduates achieve specified earnings thresholds

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