



Skills Mismatch and Workforce Readiness for Export-Oriented Textiles and Garment Manufacturing in Ghana

Dr. (Mrs.) Faustina Emefa Agordah & Dr. Moses Akrofi

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¹Dr. (Mrs.) Faustina Emefa Agordah & ²Dr. Moses Akrofi

¹Department of Fashion Design and Technology
Takoradi Technical University, Ghana

Email: faustina.agordah@ttu.edu.gh; tinaagordah@gmail.com

ORCID ID: 0000-0002-7340-1265; Phone: +233 244 469 327; +233 207 895 086

²Department of Textiles Design Technology,
Takoradi Technical University, Ghana.

Email: moses.akrofi@ttu.edu.gh; mosesakrofi@gmail.com

ORCID: 0009-0003-1286-9387; Phone: +233 242 747 543

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Abstract

Export-oriented garment manufacturing is recognised as a key pathway for Ghana's industrial diversification, yet its growth is hindered by a significant skills mismatch. A mixed-methods survey of 3,864 working-age individuals and assessments of 37 technical and vocational education and training (TVET) institutions in the Volta Region of Ghana reveal a gap between workforce skills and the competencies required for modern apparel production. Knowledge of textile fabric properties is particularly important because it influences cutting techniques, machine settings, finishing processes, and quality control. Although more than half of respondents (52.88%) demonstrate proficiency in functional stitching, proficiency in advanced skills such as pattern making (36.03% good/excellent), embroidery skills (22.67%), and machine maintenance remains limited. Vocational/technical graduates demonstrate greater operational readiness than respondents from other educational backgrounds, whereas tertiary graduates exhibit substantial competency mismatches. The TVET system is constrained by equipment shortages (78.38% of institutions), weak industry connections, low employment placement rates, and insufficient training in digital production skills. Gender is also an important factor: women, who make up 70.63% of the potential workforce, are often concentrated in lower-skilled roles because of structural barriers. This paper presents a demand-side gap analysis based on primary survey data and proposes a multi-tiered policy framework, including competency-based curriculum reform, industry–TVET collaboration, gender-responsive provisions, and a graduated apprenticeship-to-factory transition model. The findings have implications for other Sub-Saharan African economies pursuing industrial development under the African Continental Free Trade Area.

Keywords: Skills mismatch, Garment manufacturing, Workforce readiness, TVET, Ghana

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1.0 Introduction

The global garment and apparel industry is undergoing a structural reconfiguration. Rising labour costs in East and South Asia, combined with post-pandemic supply-chain diversification imperatives and the strategic logic of nearshoring, are creating new sourcing opportunities for Sub-Saharan African producers (UNCTAD, 2020; World Bank, 2020). Ghana occupies a potentially advantageous position in this reconfiguration because preferential market access through the African Growth and Opportunity Act (AGOA), the EU Interim Economic Partnership Agreement, and the African Continental Free Trade Area (AfCFTA) establishes the trade framework for export-competitive apparel production (AfCFTA Secretariat, 2023; WTO, 2022). The Government of Ghana has responded with an ambitious Textiles and Garment Sector Development Policy (2023–2033), encompassing five planned industrial parks, fiscal incentives, and a dedicated Human Capital Survey for Garment and Apparel Industrial Park Development commissioned by the Ghana Export-Import Bank for the Volta Region.

However, Ghana's apparel exports, which peaked at approximately USD 285 million in 2011, had declined to roughly USD 24.7 million by 2021, while textile and apparel imports exceeded USD 400 million, highlighting the sector's competitiveness deficit (Waddington & Onumah, 2023). Industry analysts and policy diagnostics consistently attribute this gap not only to infrastructure or financing constraints but also to a persistent skills mismatch: the divergence between the competencies that export-quality garment production demands and those that the available labour force supplies (Anyigba et al., 2024; Boateng et al., 2024; Bruce-Amartey et al., 2014). Even though there is general agreement on the concept, there is still limited empirical evidence supporting the mismatch idea based on detailed, production-level skills data in Ghana. In addition, existing analyses tend to prioritise observable production competencies while under-examining material-level knowledge, particularly the ability to identify and work with different textile fabrics, which is critical for translating basic skills into export-quality outputs.

This paper addresses that gap. Drawing on primary data from a purpose-designed human capital survey comprising a household survey of 3,864 respondents, assessments of 37 TVET institutions, and key informant interviews across nine communities in Ghana's Volta Region, we provide a systematic, multidimensional analysis of skills mismatch and how it specifically impedes the development of export-oriented garment manufacturing. Our analysis proceeds through three lenses: the supply-side educational and competency profile of the prospective workforce, the demand-side requirements derived from garment value-chain job families, and the TVET system's capacity to bridge the resulting gap. We further examine how gender intersects with mismatch dynamics and how this interaction generates layered inequities that standard skills gap analyses often overlook.

The paper makes three core contributions. First, it advances the measurement of skills mismatch in a developing-economy industrial park context by using self-assessed and observed proficiency scores disaggregated across nine garment-specific competency domains, representing a methodological improvement over credential-proxy approaches. Second, it situates TVET institutional weaknesses as

structural co-determinants of mismatch rather than as secondary concerns, highlighting how equipment deficits, weak industry linkages, and the absence of digital curricula reproduce the gap across training cycles. Third, it identifies the policy architecture necessary to operationalise Ghana's industrial park ambitions, with implications for similar initiatives across Sub-Saharan Africa under the AfCFTA framework.

2.0 Literature Review

The literature review is presented in sections.

2.1 Skills Mismatch: Conceptual Framework

Skills mismatch is a multidimensional concept that the ILO (2014) and the OECD (2017) decompose into quantitative mismatch (insufficient or excess supply of workers relative to vacancies), qualitative mismatch (competency gaps between workers' capabilities and job requirements), and spatial mismatch (geographic dislocation between labour supply and demand). For developing-country industrial parks, qualitative mismatch is typically the binding constraint: physical infrastructure and capital can be mobilised more rapidly than industrial competencies, whose formation requires coordinated education, training, and on-the-job learning systems (Rodrik, 2013; McMillan & Rodrik, 2011).

Human capital theory provides the foundational analytical scaffolding (Becker, 1964; Mincer, 1974). In the production function approach formalised by Lucas (1988) and Mankiw et al. (1992), output per worker (Q/L) is a function of physical capital intensity (K/L) and human capital intensity (H/L): $Q/L = A(K/L)^\alpha(H/L)^\beta$. This formulation makes explicit that industrial output depends not merely on the quantity of workers but on the quality dimensions of the workforce: education, skills, experience, and health. When H/L falls below the minimum threshold required for competitive factory operations, total factor productivity (A) contracts, negating returns to physical capital investment. The Volta Region industrial park context mirrors this dynamic precisely: capital is available through EXIM Bank financing, infrastructure is being developed, but H/L , particularly the technical competency component, remains the binding variable.

2.2 Skills Mismatch in Garment Sector Development

The garment and apparel sector is characterised by a distinct skills hierarchy, spanning entry-level operations (stitching and finishing), intermediate technical roles (cutting, quality inspection), and advanced functions (patternmaking, industrial engineering, supervisory management). The hierarchy's progressive structure means that any disruption in the lower tiers cascades upward: poor cutting accuracy produces defective garments regardless of sewing quality; a lack of supervisory competencies limits line efficiency regardless of operator skill (Abernathy et al., 1999; Frederick & Gereffi, 2011).

International evidence from comparable industrialisation trajectories is instructive. Bangladesh's garment sector expansion relied on deliberate investment in operator-level training delivered on factory floors, through industry associations, and through government TVET programmes, which

progressively narrowed the gap between informal tailoring traditions and industrial productivity norms (Haq et al., 2025). Ethiopia's industrial park strategy under the GTPII framework similarly invested in pre-employment training hubs co-designed with anchor investors, achieving operator readiness within twelve weeks of park operationalisation (Whitfield et al., 2020). Both cases demonstrate that skills mismatch cannot be resolved through infrastructure provision alone; rather, it requires institutional co-investment in a structured skills-formation ecosystem.

For Sub-Saharan Africa, the mismatch challenge is compounded by the informal sector's dominance of existing skills formation. In Ghana specifically, an estimated 500,000 tailors and dressmakers operate in the informal sector, representing a large latent base of partial competency that nonetheless lacks the standardisation, speed, and quality consciousness demanded by export buyers (Waddington & Onumah, 2023). Converting informal tailoring competencies into factory-ready capabilities requires not only training but also a structured transition that bridges apprenticeship traditions with industrial production systems (Quartey, 2006; Anyigba et al., 2024).

2.3 Gender and Skills Mismatch in Garment Manufacturing

Women constitute between 60% and 90% of garment production workers globally, yet their concentration in lower-skilled operational roles, combined with persistent wage differentials and barriers to supervisory progression, creates a gendered dimension of mismatch that standard skills gap analyses rarely address (ILO, 2017; Barrientos et al., 2004; Kabeer & Mahmud, 2004). Care responsibilities, mobility constraints, and gender-segmented occupational norms jointly limit women's access to training and advancement, creating a dual barrier: women are recruited for their dexterity and lower wage expectations, yet denied the development investments necessary to advance into higher-value roles (Anner, 2018; Barrientos, 2019). In the Ghanaian context, where women constitute the majority of the prospective garment workforce but are concentrated in the lowest income quintiles, these dynamics require explicit policy attention beyond generic skills development frameworks.

3.0 Research Methodology

This study draws on the Ghana EXIM Bank–commissioned Human Capital Survey for Garment and Apparel Industrial Park Development in the Volta Region conducted in 2025 across nine purposively selected communities: Dabala, Akatsi, Anloga, Afiadenyigba, Agbozume, Abor, Denu, Dzodze, and Keta. These communities span the proposed industrial corridor and its immediate labour catchment, representing a mix of semi-urban commercial hubs and rural settlements. The survey employed a mixed-methods design, integrating three quantitative instruments with a qualitative key informant interview (KII) component. The household survey used a multi-stage stratified random sampling design, developed in collaboration with the Ghana Statistical Service, that drew on enumeration area maps to ensure proportional representation across districts, urban–rural strata, and proximity zones relative to the proposed park sites. Within selected clusters, one eligible respondent aged 15–45 years was interviewed in each household using Computer-Assisted Personal Interviewing (CAPI) via

KoboToolbox, yielding a final sample of 3,864 respondents. The instrument collected data on demographic characteristics, educational attainment, employment history, technical skill proficiency across nine garment-specific competency domains, foundational skills (literacy, numeracy, digital literacy), and employment aspirations. All instruments were translated into Ewe, verified through back-translation, and administered by 55 trained enumerators, with daily digital data uploads and 10% back-check protocols.

The TVET institution survey adopted a near-census approach targeting all identified technical and vocational providers, including public, private, faith-based, and informal master-craftsperson clusters within the project catchment, yielding responses from 37 institutions. This instrument assessed governance structures, programme offerings, instructor qualifications and industry experience, student enrolment, graduate outcomes, accreditation status, work-based learning arrangements, assessment methods, digital skills coverage, operational constraints, and financing structures. Technical skill proficiency was measured using a five-point self-assessment scale (Very Poor, Poor, Fair, Good, Excellent) across nine garment production competency domains: stitching/sewing, cutting, pattern making, embroidery, finishing (ironing and packaging), quality assurance/inspection, basic machine maintenance, supervisory/line management, and logistics. Although the instrument captures nine core garment production competencies, it does not explicitly assess textile fabric identification skills. This limitation is important because material recognition and interpretation underpin several production processes, including cutting, stitching, finishing, and quality assurance.

Accordingly, fabric-related competencies are reflected indirectly in respondents' performance across these domains rather than as a standalone competency. Although self-assessed proficiency data have inherent limitations, including the potential for respondents to overstate their proficiency, the scale was anchored with behavioural descriptors and cross-validated against educational attainment patterns and employment history, thereby providing internally consistent indicators of the relative distribution of competencies. Fifteen key informant interviews with national and regional government officials, development partners, garment industry managers, and community leaders provided contextual depth to the quantitative findings. A thematic analysis of the KII transcripts identified structural and institutional factors shaping mismatch dynamics. The study received ethical clearance, and all respondents provided informed consent; anonymity was guaranteed.

4.0 Results

The results are discussed in sections

4.1 Demographic Profile of the Prospective Workforce

The survey sample of 3,864 respondents has a predominantly youthful, female-majority profile, closely aligned with global garment industry employment patterns. Women constitute 70.63% of respondents ($n = 2,729$), with women comprising the majority across all nine communities (ranging from 56.16% in Agbozume to 82.62% in Dabala). The age structure reflects a demographic dividend: 36.08% are aged 19–25 and 29.79% are aged 26–35, indicating that nearly two-thirds of the

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prospective workforce fall within the most trainable and productive working-age cohort. Only 20.01% are aged 36–45.

Employment status reveals a labour market characterised by informality and transition. The largest group comprises students and apprentices (44.00%), followed by the self-employed (38.74%). Formal employment, comprising both full-time (3.93%) and part-time (2.67%) positions, accounts for less than seven per cent of respondents. The proportion actively seeking employment is 10.02%. This structure confirms the existence of a large, potentially mobilisable but currently underutilised labour pool, most of whom are acquiring skills through informal channels rather than through formal industry exposure. Household incomes are generally low: 50.47% report monthly incomes below GHS 500, and a further 21.43% earn between GHS 500 and 999. Overall, more than 71% of households report monthly incomes below GHS 1,000, suggesting strong economic motivation for stable formal employment while also indicating that high training fees may be a prohibitive barrier to skills acquisition. Gender income disparities are sharp: women constitute 82.46% of respondents in the lowest income category (<GHS 500) but only 37.91% among those earning GHS 2,000 or more, highlighting the structural concentration of female labour in low-value activities.

Table 1: Demographic Profile of Survey Respondents

Characteristic	Category / Value	% / Frequency
Gender	Female	70.63%
	Male	29.37%
Age group (years)	15–18	14.13%
	19–25	36.08%
	26–35	29.79%
	36–45	20.01%
Employment status	Student/Apprentice	44.00%
	Self-employed	38.74%
	Unemployed	10.02%
	FT employed	3.93%
Monthly household income	< GHS 500	50.47%
	GHS 500–999	21.43%
	GHS 1,000+	28.10%

4.2 Educational Attainment and Foundational Skills

Educational attainment among the surveyed population is concentrated at the junior and senior secondary levels. Junior High School (JHS) completers form the largest cohort (44.62%; n = 1,724), followed by Senior High School/Technical graduates (32.01%; n = 1,237). Vocational/Technical Certificate holders account for 5.64% (n = 218), while tertiary graduates account for 6.42% (n = 248). Only 1.92% report no formal education. This profile suggests that the workforce has sufficient foundational literacy and numeracy to engage in structured training but lacks the sector-specific technical competencies required for formal garment manufacturing.

Foundational skills assessments corroborate this reading. English reading and writing skills are rated Good or Excellent by 68.81% of respondents, numeracy skills by 69.38%, and digital literacy skills by 68.76%. However, disaggregation by educational level reveals significant gradients: among respondents with no formal education, 40.85% rate their literacy as Very Poor and a further 10.04% as Poor, indicating that a meaningful minority will require remedial foundational-skills interventions before they can fully benefit from sector-specific technical training. Among JHS graduates, the largest cohort, literacy proficiency is moderate (44.46% Good), but the Excellent category (20.24%) is underrepresented relative to the demands of quality-conscious industrial environments. Gender stratification in educational attainment shows that women are overrepresented at lower levels of education: 85.14% of those with no formal education are female, as are 76.33% of JHS graduates. The gender gap narrows at higher levels, approaching parity among tertiary graduates (50.81% female). This pattern suggests that women's integration into higher-value garment roles, which require stronger literacy, numeracy, and supervisory competencies, will depend critically on targeted investments in education and training to redress historical access constraints.

4.3 Technical Skills Profile and Skills Mismatch

The core empirical contribution of this paper is a disaggregated analysis of technical proficiency across nine garment-specific competency domains, allowing direct comparison between available workforce capabilities and the competency requirements of export-oriented production. Table 2 summarises the proportions reporting Good or Excellent proficiency, treated here as the threshold for productive deployment in industrial settings, together with the proportions reporting Poor or Very Poor proficiency.

Table 2: Proficiency in Core Garment Production Skills

Competency Domain	Good/Excellent (%)	Poor/Very Poor (%)	No Response (%)
Stitching / Sewing	52.88%	25.95%	4.58%
Finishing (Ironing & Packaging)	62.58%	15.79%	4.48%
Quality Assurance / Inspection	51.55%	18.06%	4.99%
Basic Machine Maintenance	49.76%	22.28%	5.28%
Supervisory / Line Management	50.21%	18.04%	4.92%
Cutting	43.86%	36.05%	5.62%
Logistics (Transport/Warehousing)	46.69%	18.68%	4.14%
Pattern Making	36.03%	39.10%	7.09%
Embroidery	22.67%	49.69%	10.87%

The data reveal a competency pyramid with a relatively strong base of operational skills and a sharply narrowing apex of advanced technical and managerial capabilities. Finishing (62.58% Good/Excellent) and stitching (52.88%) are the strongest areas of competency, consistent with the

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prevalence of domestic tailoring and household-level garment practices in the region. These entry-level competencies provide a solid foundation for factory employment at the operator level, but these skills alone are insufficient for competitive export production, which demands consistency, speed, and adherence to quality at industrial scale. However, the effective deployment of these competencies in industrial settings depends on workers' ability to distinguish between fabric types and adapt to their different physical and mechanical properties. For instance, differences between woven and knitted fabrics and between natural and synthetic fibres require adjustments to cutting precision, stitching tension, and finishing techniques. The absence of explicitly measured fabric identification skills suggests that some of the observed performance gap, particularly in cutting and quality assurance, may be attributable to limitations in material-level knowledge.

The most pronounced mismatches occur in pattern making and embroidery. Only 36.03% of respondents rate their pattern-making proficiency as Good or Excellent, while 39.10% rate it as Poor/Very Poor. Pattern making is a critical pre-production function: errors at this stage cascade through cutting and sewing operations, causing material waste, production delays, and quality failures. The low level of embroidery skills proficiency (22.67% Good/Excellent; 49.69% Poor/Very Poor) represents a structural barrier to value-added product diversification, a strategic imperative for competitiveness in premium export markets. Cutting proficiency (43.86% Good/Excellent; 36.05% Poor/Very Poor) reveals a second critical bottleneck. Industrial cutting requires spatial reasoning, precision in measurement, and familiarity with both manual and automated cutting tools. These competencies are not typically developed through domestic tailoring apprenticeships. Machine maintenance (49.76% Good/Excellent) presents a mixed picture: while approximately half of respondents report functional capability, the specialised mechanical and electrical knowledge required for preventive maintenance and equipment calibration in modern facilities demands structured technical training that current informal learning pathways cannot provide.

Disaggregation by educational attainment reveals an apparent mismatch: tertiary graduates, the most credentialled cohort, report the weakest operational proficiency across all garment production domains. Among tertiary graduates, only 9.68% rate their stitching as Excellent and 16.13% as Good, compared with 21.56% and 42.20% respectively among vocational/technical graduates. For cutting, tertiary graduates show 9.68% Excellent and 8.87% Good, against 20.64% and 37.16% for vocational graduates; for pattern making, 8.87% Good versus 33.94%. This credential-competency inversion reflects the generic academic orientation of tertiary programmes and the absence of production-floor technical content. It has important implications for workforce planning: industrial parks that rely on educational credentials as a proxy for garment-sector readiness may systematically misallocate labour.

Vocational/technical certificate holders consistently report the highest proficiency across all operational competency domains, suggesting that structured, practice-oriented training is an important indicator of readiness in the garment sector. JHS graduates, the largest cohort, rank second across most operational skills, reflecting the role of informal apprenticeship in transmitting basic production competencies outside formal schooling. This informal-to-formal transition pathway is

evident but incomplete: JHS-level sewing and finishing competencies exist, but cutting accuracy, pattern interpretation, and quality inspection capabilities require the structured technical exposure that informal apprenticeship rarely provides.

4.4 TVET Institutional Capacity: Structural Drivers of Persistent Mismatch

Skills mismatch in any industrial context is partly a demand-side phenomenon, as workers lack the required competencies, and partly a supply-side institutional failure: the training system does not produce those competencies at the required scale and quality. The TVET survey reveals both dimensions in the Volta Region. The TVET ecosystem serving the corridor comprises 37 institutions: 35.14% are public TVET institutions, 27.03% are private for-profit institutions, 18.92% are universities, 16.22% are master-craftsperson clusters, and 2.70% are faith-based providers. Accreditation coverage is nearly evenly split, with 51.35% of institutions accredited by CTVET, but governance differences are pronounced: all universities are accredited, compared with 53.85% of public TVET institutions, 30.00% of private for-profit institutions, and 33.33% of association-based institutions. This accreditation gap means that the majority of informal training provision operates outside standardised quality assurance frameworks, which may result in credentials with uncertain market recognition.

Table 3: Key Operational Constraints Across TVET Institutions (n = 37)

Constraint Type	Institutions Affected (%)	Most Severe Governance Type
Equipment / Machinery Deficits	78.38%	Private for-profit (100%)
Financing Constraints	70.27%	Private for-profit (90%)
Facilities Constraints	59.46%	Universities (85.71%)
Trainer Availability Constraints	40.54%	Private for-profit (80%)
Industry Placement Limitations	24.32%	Public TVET (30.77%)
No Digital Skills Content Offered	37.84%	Private for-profit (90%)

Equipment constraints are the most pervasive institutional failure, reported by 78.38% of institutions. In a sector in which competency formation is fundamentally practice-based, operators cannot develop sewing-machine dexterity, cutting accuracy, or maintenance skills without access to functioning industrial equipment. Equipment deficits therefore directly translate into competency deficits. The gap is particularly acute among private for-profit institutions (100% equipment-constrained) and association-based master-craftsperson clusters (83.33%), which collectively provide the bulk of informal training in the region. The industry-TVET linkage is structurally weak across all governance types. Only 21.62% of institutions conduct employer surveys to inform curriculum design, and the

same proportion undertakes formal tracer studies to track graduate employment outcomes. Over 62% of institutions place no more than 25% of their students in industry attachments; 21.62% report placing no students at all. This near-absence of work-integrated learning means that graduates encounter the industrial production environment for the first time only upon employment, when induction costs, training time, and initial productivity losses accrue entirely to the employer.

Digital skills training is largely absent from the system. No institution offers enterprise resource planning (ERP) training; only 27.03% teach CAD pattern-making; 18.92% cover digital grading; and 37.84% report offering no digital content at all. Given that modern export-oriented garment facilities increasingly deploy digital pattern-making systems, production-tracking software, and quality-management platforms, this gap represents a forward-looking mismatch: graduates may enter facilities with technologies that extend beyond the scope of their training. Financing structures further reinforce institutional weaknesses. Only 27.03% of institutions receive any government subvention; 64.86% depend primarily on trainee fees; and neither donor funding (2.70% of institutions) nor corporate social responsibility support (0%) provides meaningful supplementary funding. Fee dependence limits capital investment in equipment and facilities, perpetuating the equipment deficit that directly constrains the quality of skills formation. The complete absence of CSR investment suggests a weak relationship between Ghana's nascent formal garment sector and its regional training institutions, a linkage that successful garment clusters in Bangladesh, Ethiopia, and Cambodia have established as a cornerstone of skills ecosystem development.

4.5 Discussion of the Results

The findings collectively reveal a structurally significant skills mismatch operating simultaneously at the individual, institutional, and systemic levels. At the individual level, the competency pyramid documented in Section 4.3 is strong at the base but narrows rapidly at higher technical registers. This pattern reflects the legacy of an informal apprenticeship system whose training content is calibrated for the domestic tailoring market rather than for export-quality industrial production. Informal tailors develop stitching and finishing competencies through repeated practice on domestic garment types; they do not systematically encounter the precision cutting, pattern interpretation, quality inspection protocols, or line management disciplines that buyer compliance requires. The result is a workforce with genuine but partial competence, with gaps concentrated in the high-value functions that determine export quality and production efficiency. An additional, often under-recognised dimension of this mismatch is material literacy: the ability to identify, classify, and work appropriately with different textile fabrics. Although informal apprenticeship systems in the region provide workers with experiential familiarity with commonly used materials, they rarely provide standardised knowledge of fibre composition, fabric construction, and performance characteristics required in export-oriented production. In industrial garment manufacturing, fabric properties directly influence machine calibration, seam integrity, finishing conditions, and compliance with buyer specifications, including labelling and care standards. The absence of this competency introduces a hidden layer of qualitative mismatch in which workers may demonstrate basic operational skills but are unable to consistently translate them into export-quality outputs across varying material inputs.

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The credential-competency inversion among tertiary graduates is a theoretically significant finding. Resource-based theory (Barney, 1991) suggests that human capital becomes a source of competitive advantage when it is valuable, rare, and inimitable. Tertiary credentials, in the Ghanaian context, may signal cognitive and managerial potential but do not necessarily indicate garment-specific operational readiness. Deploying tertiary graduates in production-floor roles without targeted technical bridging training misallocates human capital and generates mismatch from above, a dynamic that garment sector planning frameworks often neglect in favour of addressing the more visible deficit of insufficient basic skills. Industrial Park workforce plans should therefore stratify roles by required competency type, routing vocational and JHS-background workers into operator and technical roles while positioning tertiary graduates in supervisory, quality assurance, and industrial engineering functions, with appropriate bridging training provided for each group.

The gendered dimension of mismatch warrants particular analytical attention. Women's concentration in lower educational tiers, lower-income brackets, and caregiving roles reflects structural constraints rather than intrinsic limitations in capability. Training programmes based on gender-neutral assumptions may therefore fail to address these constraints. As Kabeer (2021) and IFC (2017) document, gender-inclusive employment in garment manufacturing yields measurable household welfare gains, but only when workplace design accommodates the care obligations and mobility constraints that predominantly shape women workers' participation decisions. The large proportion of female respondents in informal self-employment and student/apprentice categories, rather than formal employment, indicates a pool of potentially deployable labour whose participation is constrained by structural rather than competency barriers.

The TVET system's role in reproducing rather than correcting mismatch is perhaps the most policy-significant finding. The equipment deficit is not merely a resource problem; it reflects a broken industry–institution feedback loop. In Bangladesh, Cambodia, and Ethiopia, garment factory managers serve on TVET advisory boards, contribute equipment, and co-design curricula; graduates enter facilities that are recognisably similar to the training environments they have experienced. The Volta Region training ecosystem shows little comparable integration: 78.38% of institutions report equipment constraints, 78.38% lack employer survey mechanisms, and over 62% place only a small proportion of students in industry. This threefold failure in equipment, feedback, and placement ensures that each graduating cohort enters the labour market with the same competency deficits as the previous cohort, with no systemic mechanism to close the gap.

5.0 Conclusion

This paper documents a multidimensional skills mismatch in Ghana's Volta Region that poses a binding constraint on the development of competitive, export-oriented garment manufacturing. Using granular, production-domain-level proficiency data from 3,864 prospective workers and an institutional assessment of 37 TVET providers, this study demonstrates that the mismatch operates simultaneously at three levels: a workforce whose operational competencies are oriented towards informal domestic tailoring rather than industrial export production; an inverted credential-

competency relationship that misaligns tertiary graduates with operator-level roles; and a TVET system characterised by equipment deficits, absent industry feedback loops, and gaps in digital skills that structurally reproduces the competency gap across successive graduate cohorts.

Gender intersects with skills mismatch in ways that standard gap analyses often fail to capture. Women's concentration in lower-skilled roles and lower-income brackets reflects structural barriers that generic training programmes do not adequately address. This pattern requires deliberate, gender-responsive workplace and training design as an operational prerequisite for sustainable workforce participation.

The proposed policy architecture, comprising a Garment Skills Compact, a Pre-Employment Training Hub, an Apprenticeship-to-Factory Transition Programme, and mandatory gender-responsive workplace provisions, draws on lessons from comparable industrial park developments in Bangladesh, Ethiopia, and Vietnam and adapts them to Ghana's institutional context. As Ghana operationalises its industrial park strategy under the AfCFTA framework, evidence from the Volta Region underscores a fundamental developmental truth: infrastructure without skills is incomplete. The returns on physical capital investment in export manufacturing depend on commensurate investment in the human capital system that operationalises it. Future research should examine the evolving trajectory of skills mismatch as the industrial park becomes operational, particularly how quickly employer-driven on-the-job learning closes the competency gaps identified here and the extent to which gender-responsive workplace provisions translate into measurable improvements in female workforce retention and upward occupational mobility.

6.0 Policy Implications and Recommendations

The evidence supports a multi-tiered policy framework organised around four strategic priorities. First, establish a Garment Manufacturing Skills Compact between the Ghana EXIM Bank, the Ministry of Trade and Industry, CTVET, and prospective industrial park investors. The Compact should formalise industry co-design of a competency-based garment training curriculum aligned with the National Technical and Vocational Education and Training Qualifications Framework (NTVETQF), require employer representation on TVET curriculum boards, and link public TVET funding to accreditation status and industry placement rates. Comparable mechanisms in Vietnam and Ethiopia reduced operator ramp-up time from an average of eight weeks to under four weeks within two years of implementation.

Second, a Pre-Employment Training Hub should be established within or adjacent to the Volta Region industrial park. Drawing on the Bangladesh model, the hub should deliver a twelve-week intensive programme for entry-level operator candidates (targeted at JHS and SHS graduates) covering industrial stitching, cutting techniques, quality inspection protocols, occupational health and safety, and basic productivity measurement. A separate eight-week supervisory track for tertiary and advanced vocational graduates should cover line management, lean production principles, basic industrial engineering methods, and digital production tools. The hub should be equipped to match

the park's facility specifications, eliminating the equipment mismatch that compounds the skills deficit.

Third, a structured Apprenticeship-to-Factory Transition Programme should be implemented to formalise and upgrade the existing informal skills base. The programme should offer qualified informal tailors one-year apprenticeships within park factories, with standardised competency certification aligned with NTVETQF levels to facilitate entry into formal employment. This approach would preserve the substantial informal sector skills base while converting partial competency into industry-grade capability, drawing on Ghanaian apprenticeship traditions rather than displacing them. Fourth, gender-responsive provisions should be embedded as operational requirements rather than treated as add-ons. Minimum standards for on-site or subsidised childcare, flexible shift scheduling, return-to-work pathways after caregiving breaks, and transparent promotion criteria should be incorporated into investor licence conditions for the industrial park, rather than left to employers' voluntary discretion. These provisions are critical for mobilising the female-majority labour pool, which constitutes the region's principal workforce reservoir, and for preventing high attrition driven by irreconcilable care obligations.

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