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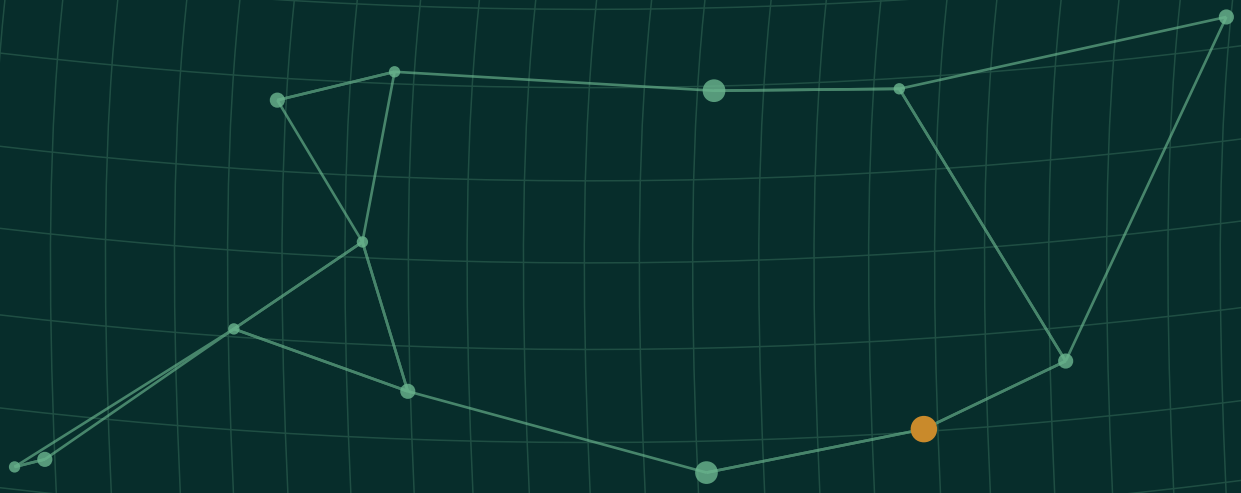
The Supervisor Gap

Building the skilled-supervisor and technician pipeline for African garment manufacturing



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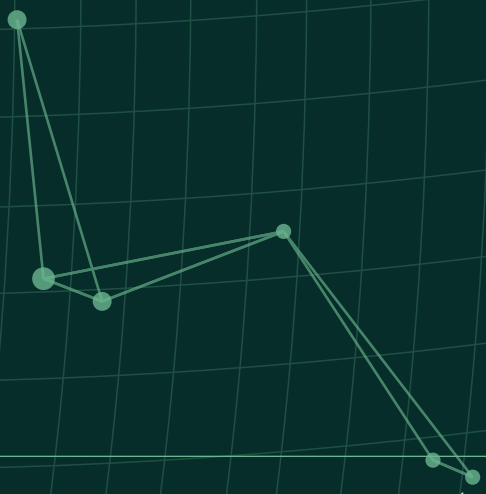


THE GFT THESIS

Value is made where it is measured.

GFT engineers sustainable factories that capture their own data from the first shift, so raw-material economies can keep the value they grow.





Read the evidence before acting on the recommendation.

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Build the factory and its evidence as one system.

Greenfield garment business plans across Sub-Saharan Africa routinely fail on a single arithmetic error: they treat a low statutory minimum wage as an automatic unit-cost advantage. In Cameroon, the statutory minimum wage (SMIG) stood at XAF 43,969 a month from 23 February 2024, about US$76, roughly one-third of Cambodia's US$204 monthly garment benchmark (R14, R17). Yet empirical firm-level studies across African manufacturing show that low line efficiency, high rework, machine stoppages and worker attrition routinely erase nominal wage gaps (S11, S24, S28). Where informal employment absorbs roughly 90 percent of the workforce (R16, S42), hiring trainable sewing operators is straightforward, but experienced line supervisors, work-study technicians and sewing-machine mechanics are scarce. [R16] [R29] Importing large cohorts of permanent expatriate supervisors inflates overhead and triggers cultural friction on the floor (S09, S24). Drawing on Green Future Tech's Cameroon textile programme for an illustrative 3.0-million-garment, 900-person cut-make-trim operation, this paper sets out an engineering blueprint to close the supervisor gap. It details the hourly control duties of line supervisors, industrial-engineering technicians, mechanics and quality leads; connects Cameroon's TVET and northern cotton-belt training institutions to an off-line vestibule training dojo; models a seeded expatriate-to-local mentorship ladder and SMIG-compliant yield incentives; and gates an eighteen-month factory ramp on measured supervisory readiness.

01 Cameroon's statutory minimum wage of XAF 43,969 a month (about US$76 as of February 2024) is roughly one-third of Cambodia's US$204 garment minimum wage, but Sub-Saharan African manufacturing labour costs more per unit of GDP than comparator regions unless shop-floor supervision lifts productivity. [R14] [R15] [R17] [S11] [S28]

02 Informal employment accounts for 89.5 to 90.0 percent of Cameroon's labour force and industry employs only 13.4 percent, meaning new garment recruits require structured conditioning in standard minute values, bundle flow and visual quality control. [R16] [S12] [S41] [S42]

03 Line supervisors trained in structured supervisory skills increase garment line productivity by 5.8 to 22.0 percent by reducing the time operators need to hit hourly targets and by dynamically reallocating workers during disruptions. [S02] [S04] [S20] [S21] [S23]

04 Managerial subjective rankings misallocate training: supervisors ranked lowest by middle management generate productivity gains above 11 percent when trained, while female operators remain severely under-promoted on lines where nearly 80 percent of operators are women. [S01] [S02] [S03]

05 Unbalanced garment lines operate at 50 to 67.6 percent efficiency, whereas industrial-engineering technicians applying heuristic line-balancing methods (Ranked Positional Weight, Largest Candidate Rule, Kilbridge-Wester) raise line efficiency to between 85.9 and 97.35 percent. [S21] [S31] [S32]

06 Over-reliance on permanent expatriate supervisors in African apparel parks inflates overhead and neglects systematic technology transfer, whereas a small, time-bound mentor cohort paired with local promote-from-within trainees localises capability within 18 months. [S06] [S09] [S10] [S24]

07 Cameroon's formal TVET system receives only 12.5 percent of the 657.9 billion XAF national education budget (together with higher education) and trains only 5.3 percent of informal workers, requiring factories to build in-house vestibule training dojos supplemented by PADESCE vouchers and Garoua textile training partnerships. [S15] [S16] [S17] [S18] [S33] [S42]

08 Preventive sewing-machine maintenance and operator autonomous upkeep governed by Mean Time Between Failures (MTBF) and Mean Time to Repair (MTTR) protect line availability and limit euro-pegged CFA franc exposure on imported spare parts. [R12] [R32] [S38] [S39]

09 Combining source-level Traffic Light System (TLS) inline quality patrols with edge computer-vision inspection lifts defect detection from the 60 to 70 percent manual baseline to above 90 percent across more than 40 defect types and cuts sewing rework by 12 percent. [R28] [R29] [S21] [S37]

10 For an illustrative 3.0-million-garment, 900-person factory, Phase 1 launch must be gated on certifying the first cohort of 12 line supervisors, 8 mechanics and industrial-engineering technicians, and live manual Performance-Management System logs before capital is committed to scale. [R10] [R12] [R14] [S08]

01

Low Nominal Wages Fail to Deliver Low Unit Costs Without Shop-Floor Supervision

Cameroon's statutory minimum wage sits far below Asian garment benchmarks, yet nominal wage spreads contract on the sewing floor unless trained supervisors and technicians hold utilisation and first-pass yield on target. [R14] [R17]

CHAPTER 01
DECISION TEST

Cameroon's statutory minimum wage sits far below Asian garment benchmarks, yet nominal wage spreads contract on the sewing floor unless trained supervisors and technicians hold utilisation and first-pass yield on target. [R14] [R17]

Low nominal wages do not, by themselves, create low unit labour costs. The decision variable is the cost of paid labour and supervision divided by good garments that leave finishing without rework. Cameroon's statutory minimum wage was about US$76 a month from February 2024, against a Cambodian garment-sector minimum of US$204 for 2024. That gap is a genuine starting advantage, not a completed cost model. [R14] [R17] Firm-level research finds labour more costly in Sub-Saharan Africa at a given level of gross domestic product, while Ethiopian apparel research shows how low productivity can make very cheap labour expensive in output terms. [S28] [S11] The answer is therefore not to discard the wage advantage. It is to engineer the supervisory and technical system that preserves it: measured work content, balanced flow, available machines, early defect correction and daily decisions owned at the line.

1.1

Nominal wage floors create an illusion of automatic cost competitiveness

Cameroon raised its cross-sector statutory monthly minimum wage, the SMIG, by 5 percent from XAF 41,875 in 2023 to XAF 43,969 from 23 February 2024. The inherited register records the revised floor as approximately US$76 a month. [R14] Cambodia's garment-sector minimum for 2024 was US$204 a month. Simple division places Cameroon's floor at about 37.3 percent of that benchmark, before any adjustment for output, benefits or quality. [R14] [R17] The same register puts Cameroon's cross-sector average salary near US$359 a month, a reminder that a legal entry floor is not the prevailing cost of every worker, still less the cost of scarce technicians and supervisors. [R15]

Three boundaries matter before this comparison enters an investment model. First, the SMIG is a statutory base, not a fully loaded employment cost. It excludes supervisory overhead, statutory employer obligations, recruitment, training, paid non-production time and the cost of getting a new operator to standard performance. Secondly, the Cambodian figure is a sector minimum, while Cameroon's figure is cross-sector. The comparison is useful as a nominal benchmark but not as a matched occupational wage survey. Thirdly, monthly wages say nothing about how many compliant garments an operator produces in that month. [R14] [R15] [R17]

Wage differences nevertheless influence where capital goes. The ILO's Indonesian factory cases describe managers considering regional minimum-wage differences when relocating production, even as important sewing operations remained manual. This is the valid, limited role of a wage screen: it identifies places worth testing, not places whose unit economics are already proven. [S05] A sponsor who stops at the screen confuses an input price with a production result. The error becomes especially costly in a greenfield plan that divides a local monthly wage by output observed on an experienced Asian line. That calculation imports the comparator's skill, balance and attendance without importing the management system that created them.

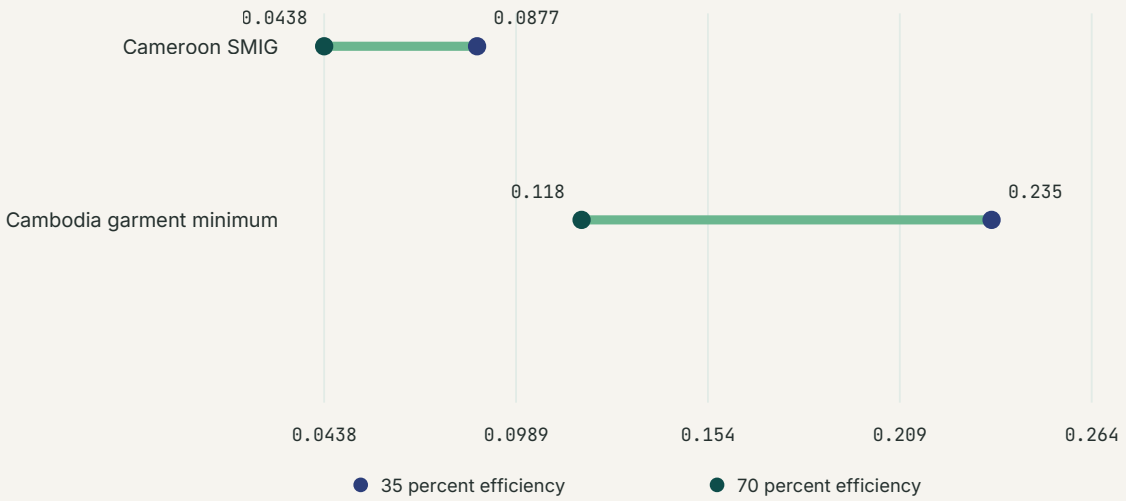
The correct starting identity is direct labour cost per good garment equals direct payroll divided by good output. Good output depends on attended minutes, standard work content, line efficiency and first-pass yield. Line efficiency should be expressed

as standard minutes earned divided by operator minutes attended, not simply pieces counted at the end of a shift. First-pass yield then removes units that require mending or alter the promised quality. This prevents a fast but defective line from appearing cheap.

Exhibit 1, p. 17 applies this identity to a deliberately simple T-shirt case. The monthly wage inputs are sourced. The garment work content and efficiency states are illustrative, chosen to expose the mechanism rather than estimate a factory.

EXHIBIT 01 / US$ PER GOOD T-SHIRT, ILLUSTRATIVE

Doubling line efficiency halves direct labour cost per good T-shirt in both wage settings



DERIVED [R14] [R16] [R17] Derived scenario, not observed factory output. Wage inputs are US$76 for Cameroon SMIG (R14) and US$204 for Cambodia's 2024 garment minimum (R17). Attendance basis is 40 hours per week (R16), 52 weeks divided by 12 months, or 10,400 minutes per month. Illustrative garment work content is 4.20 standard minutes and first-pass yield is held at 100 percent to isolate efficiency. Good pieces equal 10,400 times efficiency divided by 4.20. Unit cost equals monthly wage divided by good pieces. At 35 percent efficiency, output is 866.67 pieces; at 70 percent, 1,733.33 pieces.

The exhibit establishes a proportion, not a country ranking for every operating condition. At equal efficiency and with every other assumption held constant, the wage ratio carries through to direct labour cost. Doubling efficiency halves the unit figure in both settings because the same paid month produces twice as many good pieces. It says nothing yet about whether a greenfield line can reach the higher state, who will get it there, or how much that capability costs.

WORKED EXAMPLE: FIND THE INVERSION THRESHOLD INSTEAD OF ASSUMING IT

Use the sourced monthly wages of US$76 and US$204, the sourced 40-hour week, and an illustrative 4.20 standard minutes per T-shirt. A month contains 10,400 attended minutes on the 52-week annual convention. At 35 percent efficiency, the Cameroon case yields 10,400 × 0.35 ÷ 4.20 = 866.67 pieces and a direct labour cost of 76 ÷ 866.67 = US$0.0877 per piece. The Cambodia comparator at 70 percent yields 1,733.33 pieces and costs 204 ÷ 1,733.33 = US$0.1177 per piece. Cameroon remains about 25.5 percent cheaper in this mismatched scenario. [R14] [R16] [R17]

The inversion occurs only when the efficiency gap becomes wider. Holding the Cambodia comparator at 70 percent, equality requires Cameroon efficiency of (76 ÷ 204) × 70 percent = 26.1 percent. At an illustrative 20 percent Cameroon efficiency, direct labour cost is US$0.1535 per good piece, about 30.4 percent above the Cambodia comparator at 70 percent. These are arithmetic scenarios, not forecasts or measured plant results. [R14] [R16] [R17]

This threshold is more useful than a general claim that low wages never matter. They do matter. Supervision protects their value by preventing the efficiency ratio from collapsing through the inversion point. It also makes the cost of supervision testable: the additional payroll and training expenditure should be compared with the avoided loss per good garment, not treated as an unpriced administrative burden.

1.2

Sub-Saharan African manufacturing labour is costlier per unit of output than nominal wages suggest

The paradox persists when the analysis moves from a single garment to firm-level evidence. Gelb, Meyer, Ramachandran and Wadhwa constructed a panel from World Bank Enterprise Surveys across low- and middle-income countries. Their models estimate that, for any given level of GDP, labour is more costly for firms located in Sub-Saharan Africa. They also identify exceptions and candidates, including Ethiopia, rather than declaring every African location uncompetitive. [S28] This distinction matters. The finding is a conditional relationship across firms and countries, not a universal tariff on African production and not a direct measure of sewing cost per garment.

Ethiopian apparel evidence supplies the operating interpretation. Staritz and Whitfield found that workers new to apparel factories required internal basic-skills training, yet productivity remained low by international standards. They conclude that Ethiopian labour could be relatively expensive in productivity terms even though its nominal cost was very low. The same account records buyers finding that, once all costs were counted, some Ethiopian prices did not compare favourably with Bangladesh. [S11] A low hourly wage was therefore only one component of the delivered price. Capability, input reliability and factory learning determined whether the nominal saving survived production.

The ILO's Ethiopian sector assessment gives this problem a measurable skills dimension. It reports that inexperienced managers, technicians and supervisors, weak human-resource capacity and resistance to change reduced sector productivity. It identifies production management, planning and engineering, machine maintenance and repair as processes with severe skills gaps. [S06] The constraint is not an undifferentiated shortage of people willing to sew. It is a shortage of people able to convert individual sewing effort into stable line output.

The comparative figures are sobering but require exact labels. The ILO assessment states that Ethiopian manufacturing labour productivity was only 47 percent of Kenya's level. Separately, it records Ethiopia's 2018 garment exports as US$261 million below Kenya's, after roughly similar export positions in the early 2000s. [S06] These observations do not prove that supervision alone caused the gap. They show why a business plan cannot infer competitive output from labour abundance or low pay while ignoring productivity, capacity use, logistics and industrial capability.

The regional pattern reinforces the point. World Bank analysis reports that Sub-Saharan African manufacturing employment roughly tripled from 6 million in 2000 to 20 million in 2018, raising manufacturing's employment share from 7.2 to 8.4 percent. Over the same comparison, manufacturing's GDP share edged down from 12.1 to 11.5 percent. The authors describe incomplete transformation rather than simple deindustrialisation. [S29] Employment expanded without the sustained within-sector productivity growth needed to make each additional worker more valuable.

Firm-level research explains one mechanism behind that aggregate pattern. Diao, Ellis, McMillan and Rodrik distinguish larger firms with stronger productivity but limited employment expansion from smaller firms that absorb labour without much productivity growth. Their Tanzanian and Ethiopian panels also show the role of capital-intensive techniques among larger firms. [S30] The lesson for a garment sponsor is not to choose labour instead of capital or capital instead of labour. It is to combine equipment, methods and management so that the chosen combination raises good output per paid minute.

Three different measures must therefore stay separate. Labour cost relative to GDP is a macro-comparative construct. Factory labour cost per good garment is an operating construct. Line efficiency against standard minutes is an engineering construct. They can inform one another, but none can silently replace the others. The cross-country evidence establishes why nominal wages are insufficient. The factory model must then identify the actual denominator, period and loss mechanisms by which a specific line converts wages into saleable output. [S28] [S29] [S30]

Supervision is not the only explanation for these gaps. The Ethiopian assessments also identify electricity, raw-material shortages, logistics, limited capacity use and turnover. A serious cost model carries those factors explicitly rather than hiding them inside a generic productivity discount. [S06] [S11] The supervisory workstream is distinctive because it acts across several of them every shift: it records the stoppage, protects the bottleneck, assigns the available skill and makes the remaining loss visible for engineering or management action.

1.3

Capacity underutilisation destroys unit economics before wage rates can rescue them

A garment plant carries costs that do not fall in proportion to output. Building and machine depreciation, core management, quality systems, maintenance capability, utility connections and a minimum energy baseline remain while lines wait for material, skills or repairs. The relevant fixed-cost identity is fixed cost per good garment equals period fixed cost divided by good garments completed in that period. Because good garments sit in the denominator, unit fixed cost rises faster as output falls. The curve is not a convenient linear discount that can be inserted after the ramp.

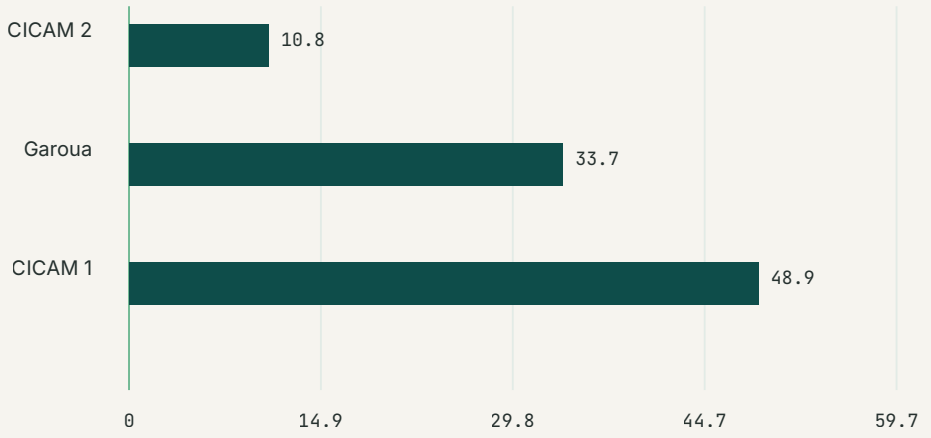
This is why nameplate capacity is a weak financial denominator. Nameplate describes what installed equipment could produce under stated conditions. Saleable output records what the whole system actually completed to the required quality. A line can have capable operators and modern machines yet lose output through unbalanced work, unavailable attachments, late bundles, absent operators or unresolved defects. Supervisors cannot remove every cause, but without a named person controlling the hourly flow these losses remain anonymous until the shift is over.

Cameroon's textile incumbent offers a historical warning, not a direct template for a new garment line. The inherited register records CICAM's domestic market share falling from about 85 percent three decades ago to about 5 percent. [R11] A July 2023 report recorded capacity utilisation of 33.7 percent at Garoua, 48.9 percent at CICAM 1 and 10.83 percent at CICAM 2. [R12] These are plant utilisation observations across an incumbent with its own equipment, market and material constraints. They are not measurements of GFT performance or of sewing-line efficiency.

Exhibit 2, p. 21 keeps the three site observations on their original denominator. Its purpose is to show how much installed capacity can remain unused, not to rank garment lines or infer a greenfield ramp.

EXHIBIT 02 / PERCENT OF CAPACITY UTILISED, JULY 2023 REPORT

CICAM sites used only 10.83 to 48.9 percent of capacity in the July 2023 report



SOURCED [R12] Inherited sector observations from R12. Original source publication metadata is not separately recorded in the shared register. Capacity utilisation is not the same measure as sewing-line efficiency, overall equipment effectiveness or first-pass yield. These figures are not GFT operating results.

The financial record makes underuse more than an engineering concern. The shared register attributes about CFAF 2 billion of cost in 2020 to CICAM's underutilisation. Separate restructuring estimates range from CFAF 30.7 to 48.2 billion, with one relaunch plan cited at CFAF 70.2 billion. [R12] [R13] These amounts should not be added together or presented as the cost of supervision failure. They belong to different decisions and estimates. Their common lesson is narrower: once an industrial system falls into chronic underuse, later repair can require commitments on a completely different scale from disciplined early operation.

New projects face the same denominator even when their technology and governance differ. The announced Camtext SA project is recorded at US$300 million, or 180 billion XAF, with planned processing of 12,000 tonnes of fibre a year. Its stated plan includes about 12,000 jobs at Dibamba and 3,000 at Garoua, with optimal capacity around 2033. [R09] [R10] These are announced capacities and employment intentions, not realised output. The operational inference for any such project is straightforward: installed machines and recruited headcount do not amortise themselves. Only coordinated, good production does.

METHOD

Keep four denominators in the operating model. Capacity utilisation compares actual output with nameplate output. Line efficiency compares standard minutes earned with operator minutes attended. First-pass yield compares units accepted without rework with units presented for inspection. Cost per good garment divides the relevant period cost by units that pass the defined quality boundary. A management pack that swaps these denominators can make a low-output plant appear efficient, or a fast line appear profitable while rework consumes its margin.

This boundary also tells management where to intervene. If attendance is high but standard minutes earned are low, the problem lies in method, balance, availability or skill rather than recruitment volume. If efficiency appears acceptable but first-pass yield is weak, output speed is not converting into saleable garments. If both are stable but plant utilisation remains low, the constraint may sit in orders, materials or the number of lines released. Supervision supplies the line-level evidence needed to distinguish these cases; it is not a universal remedy for every cause.

1.4

Sewing assembly resists full automation, keeping human supervision decisive

Automation changes garment work unevenly. The ILO's study of Indonesian apparel and footwear factories finds growing automation in fabric cutting and spreading, but little automation in apparel sewing because of technical bottlenecks. It links those bottlenecks to pliable fabrics and product variety. [S05] Fabric bends, stretches and changes behaviour at the needle. A machine can automate a defined motion more readily than it can perceive and correct every variation in a soft assembly.

The same study is useful because it does not reject technology. Automated cutting improved precision and raised output in the cases examined, while manual sewing remained important and some cutting tasks still required manual handling. [S05] The decision is therefore not automation against people. It is where to place automation so that people can control flow and exceptions. Cutting precision can reduce downstream variation, but it does not eliminate the need to coordinate the sequence of sewing operations.

Garment assembly amplifies local interruptions because work passes through linked operations. In the Indian garment firm studied for the STITCH trial, cutting teams organised components into bundles, sewing lines assembled them, and finishing teams completed quality checking and packing. Supervisors set the initial line architecture and later changed task allocations, added helpers or introduced another machine when bottlenecks emerged. [S02] The productive unit is consequently the line, not an isolated operator's maximum speed. One overloaded operation can starve downstream work while inventory accumulates upstream.

Human attention also matters when conditions move away from the standard. Research pairing hourly garment productivity with pollution exposure finds that managers responded to shocks by reassigning workers towards tasks where they performed better. Managers measured as more attentive were better able to mitigate the resulting productivity declines. [S04] This is a specific finding about task allocation under shocks, not proof that every supervisor improves every line. It does show why a static operation breakdown cannot run itself.

GFT's Cameroon textile programme uses an illustrative 3.0-million-garment, 900-person cut-make-trim case to make this dependency explicit. Those figures are planning assumptions, not achieved production or employment. Their analytical value lies in the coordination burden they represent: many operators, styles and hand-offs

must produce to a common standard before output can be treated as capacity. The supervisor and technician layer supplies that coordination at the point where fabric, machine settings, operator skill and quality meet.

Technology then becomes a force multiplier for the control layer rather than a substitute for it. Hourly boards reveal a developing shortage. Machine logs distinguish availability from operator pace. Quality records show whether output is good enough to count. Digital tools can organise these signals, but a trained person still has to decide whether to rebalance work, call a mechanic, stop a defective operation or change the next bundle. That decision loop is the productive asset that a nominal wage table cannot describe.

1.5

Management trials show that supervisory practices change plant productivity

The strongest answer to the wage paradox comes from interventions, not from comparing countries after the event. Cross-country studies establish association and describe constraints. Field evaluations ask a different question: what happens when the factory changes the way people manage quality, maintenance, inventory, work allocation and communication? The evidence below comes from distinct settings and designs. Their effect sizes are not interchangeable, but together they show that management practice is a productive input rather than an administrative decoration.

The STITCH garment study provides the closest line-level evidence. Productivity on lines managed by treated supervisors increased by 7.3 percent during training relative to control lines. Six months after programme completion, the treated lines remained 5.8 percent higher relative to control. [S02] The persistence matters. A brief improvement during a course could reflect observation or novelty. A remaining difference after the course indicates that supervisors retained practices which continued to change line performance.

The study also describes what that management looks like between bundles. Supervisors respond to imbalances and absenteeism by switching task allocations across machines, adding a helper or placing a second machine at a critical operation. [S02] This connects the measured outcome to the physical mechanism discussed above. Training does not make the fabric easier to sew. It improves the decisions that stop one difficult operation from setting the pace for the whole line. The result therefore supports investment in decision capability, not simply attendance at a classroom course.

The Indian textile experiment examined a broader management package across multiple plants. Its practices covered quality control, preventive maintenance, inventory and human resources. The researchers report an initial average productivity increase of 11 percent through improved quality and efficiency and reduced inventory. They also calculate an increase in annual profitability of about US$230,000 for the median firm in their analysis. [S25] The evaluation summary published by Innovations for Poverty Action reports a 17 percent productivity increase in the first year and the

opening of more production plants within three years. [S26] The two reported productivity figures belong to different summaries and periods of the same intervention; they should not be added or treated as two separate treatments.

This evidence does not imply that a Cameroon sewing line will receive the same gain from copying a checklist. The Indian intervention addressed the whole management system, while STITCH addressed garment supervisors. Their common lesson is more precise: output responds when the factory changes who observes work, what they record, which exception triggers action and how the corrective decision is verified. The wage bill purchases attended time. Management determines how much of that time becomes accepted production.

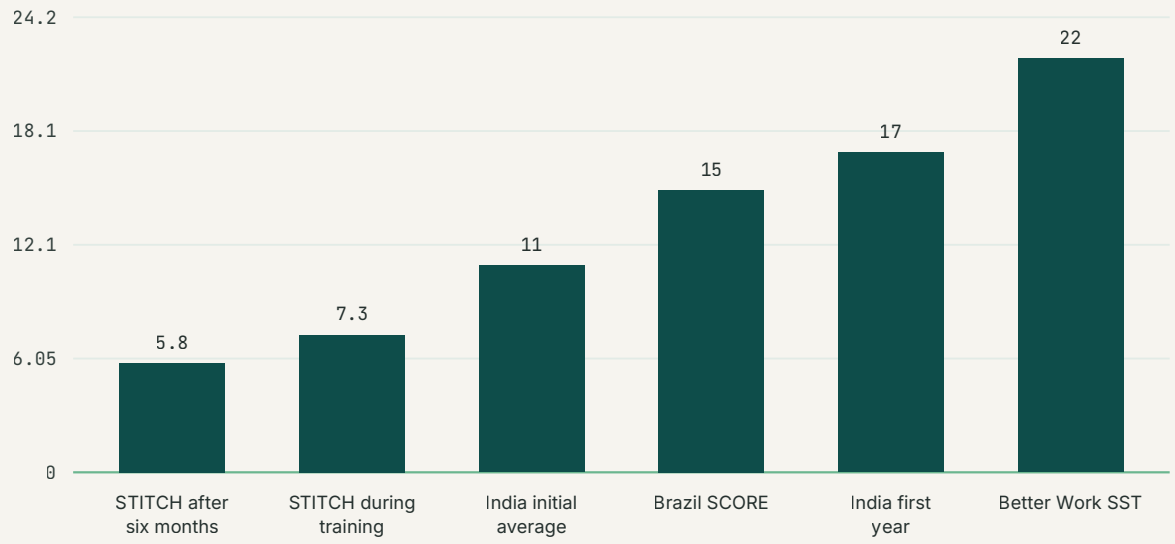
Better Work supplies another garment-specific result. Its evaluation reports that Supervisory Skills Training reduced the time needed to reach production targets, resulting in a 22 percent productivity increase on lines supervised by trained supervisors. The reported effect was driven by the female supervisors who undertook the training. [S20] This is evidence for professional floor leadership, including communication and worker treatment, rather than for closer surveillance alone. A supervisor who creates fear may obtain a short burst of activity while making errors, absence and turnover harder to control.

The ILO's SCORE results in Brazil add the quality denominator. Subcontracted sewing workshops reported a 15 percent average productivity increase and a 12 percent reduction in rework rates, using data collected by SENAI. [S21] The pairing is important. More pieces leaving a station are not necessarily more value. A programme that raises productivity while reducing rework improves the flow of good garments, which is the denominator relevant to unit cost and delivery.

Exhibit 3, p. 25 places the reported gains side by side to show their range. It is not a league table. The populations, intervention content, counterfactuals and observation periods differ, so the chart cannot support an expectation that any one factory will achieve the largest value.

EXHIBIT 03 / PERCENT PRODUCTIVITY INCREASE REPORTED IN EACH EVALUATION

Reported productivity gains range from 5.8 to 22 percent across distinct management evaluations



SOURCED [S02] [S20] [S21] [S25] [S26] Sourced results, not a pooled effect or a forecast for Cameroon. STITCH reports 7.3 percent during training and 5.8 percent six months after completion relative to control (S02). Indian textile management reports an 11 percent initial average gain (S25), while the IPA summary reports 17 percent in the first year (S26). Brazil SCORE reports a 15 percent average gain (S21). Better Work reports 22 percent on lines with trained supervisors (S20). Designs, periods and populations differ; bars must not be ranked as comparable treatment effects.

The practical implication is to test mechanisms locally rather than import an average uplift. A factory should establish a measured baseline, train a defined cohort, retain a comparison where operating conditions permit, and track good output per attended minute through and after the intervention. It should also record absence, rework and downtime so that an apparent productivity gain cannot hide a quality or people cost. Evidence from other factories justifies the experiment and the budget. It does not remove the need for local verification.

1.6

GFT funds the supervisor and technician pipeline as a capital workstream

GFT's position follows directly from the cost identity: capability must be built before it can protect output. The three-part Cameroon textile programme, covering a feasibility study, performance-management system design and digital strategy, was prepared on 31 January 2024 with later source refreshes. It treats the supervisor gap as a structural operating risk, not a recruitment detail to be settled after machinery arrives. The programme's illustrative factory case supplies a planning context, not evidence of an operating plant or a realised result.

The response is a named pre-operating workstream for line supervisors and technicians. Its deliverables are people who can perform defined tasks, records that make performance visible and a decision cadence that assigns each exception to an owner.

A recruitment requisition alone cannot deliver those outcomes. The workstream needs its own budget, programme lead, practical assessments and release conditions, with the same visibility as equipment installation or building preparation.

This sequencing changes what the first production line represents. It is not merely the first group of machines earning revenue. It is the test of whether the factory can convert attended labour into good output under local conditions. Before release, the sponsor needs evidence that the responsible supervisor can read the operation breakdown, rebalance work after an absence, run the hourly record, escalate a machine fault and act on a defect at its source. Technicians need to prove the supporting work-study, maintenance and quality routines. A line that starts without these capabilities may produce garments, but it cannot produce trustworthy unit economics.

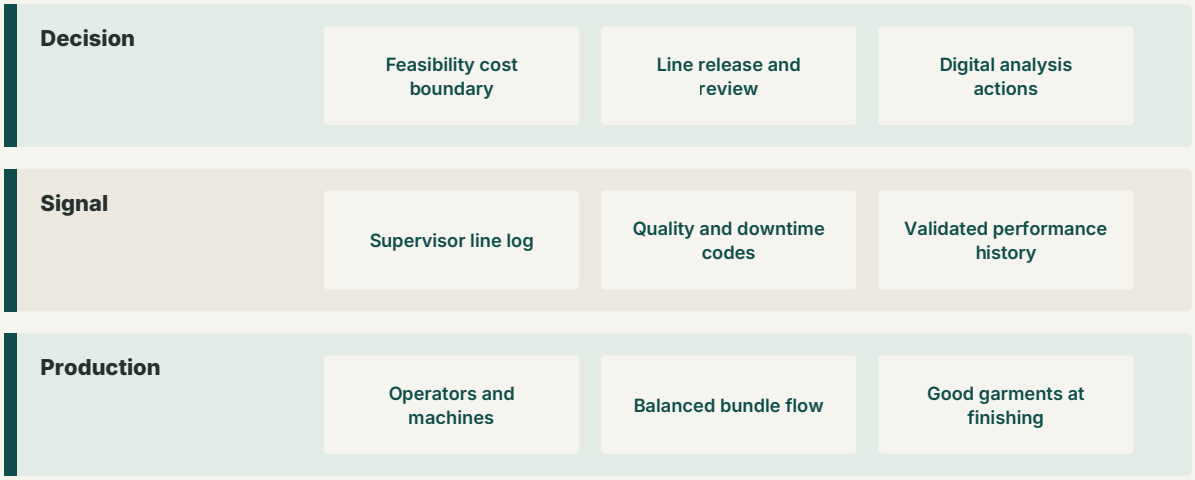
> **GFT NOTE**
>
> Ring-fence supervisor and technician development as pre-operating capital. Gate each line release on practical certification and a live manual control loop: an operation breakdown, an hourly output record, a skill-based allocation decision, a downtime cause code and a first-pass quality result. Do not accept classroom attendance as proof of readiness, and do not wait for a digital platform before starting the records that make the line manageable.

The three programme components meet at this control loop. The feasibility model defines the production and cost boundary. The performance-management system assigns ownership, timing and review to the line record. The digital strategy can then organise validated signals for analysis rather than reconstructing events from incomplete recollections. Supervisors and technicians sit across all three because they both operate the physical system and originate much of its primary evidence.

Exhibit 4, p. 27 shows that relationship as an illustrative architecture. It does not claim that the depicted system is already implemented. Its purpose is to prevent a common separation of duties in which one team plans capacity, another builds dashboards and a third is left to manage unmeasured production.

EXHIBIT 04 /

Supervisor-owned control connects the operating model to measurement and later digital analysis



ILLUSTRATIVE Illustrative GFT programme architecture, not a claim of implemented factory systems or achieved results. The layers define how the feasibility model, manual performance records and digital analysis should share one production boundary.

Funding this layer does not mean treating every supervisory salary as capital in the accounting sense. The point is investment appraisal, not an accounting classification. Pre-production recruitment, instruction, practice time, mentoring and assessment create capability before commercial output begins. They should therefore be visible in the launch budget and evaluated against the losses they are intended to avoid. Once lines operate, recurring supervision remains part of the cost base and belongs in unit cost per good garment.

The same boundary makes the business case testable. Let the capability cost for a period include the additional supervisor and technician payroll, trainer time and the applicable training expense. Divide that cost by the good garments whose output the intervention can plausibly affect. Then compare the resulting amount with the measured change in direct labour, rework and fixed cost per good unit. This is a counterfactual evaluation, so it requires a baseline and attention to other changes such as style, order volume and machine installation. A simple before-and-after claim is not enough.

Supervision should not become an unexamined overhead in the name of capability. Span of control, duplicated reporting and meeting time need review just as operator idle time does. The objective is the smallest technical and supervisory structure that can detect and resolve exceptions at the required speed. Its value appears in faster flow, fewer repeated defects, less unresolved downtime and reliable records. If those outcomes do not change, adding hierarchy is not a solution.

1.7

The paper separates comparative evidence from the Cameroon investment case

The argument proceeds in four stages. Part I establishes the wage-productivity problem, the industrial-conditioning deficit and the risks of permanent dependence on expatriate floor leadership. Part II examines the line supervisor, industrial-engineering technician, sewing-machine mechanic and quality lead as distinct production roles. Part III designs the training and promotion pipeline. Part IV tests compensation, cohort arithmetic and condition-gated rollout. This order matters: a staffing plan has little value until the unit-cost mechanism and the work of each role are explicit.

The sector opportunity supplies context but not proof of factory competitiveness. The inherited register records about 95 percent of Cameroon's cotton fibre exported raw and about 5 percent processed locally, alongside a national target of 50 percent local processing by 2030. [R06] [R07] More local processing can increase the need for industrial capability; it does not guarantee that any individual plant will achieve efficient production. The same caution applies to market access. The register records Cameroon's AGOA eligibility as terminated with effect from 1 January 2020 and lists the country as ineligible for calendar year 2025. [R18] These observations frame the programme's risk analysis without becoming claims about conditions after their recorded dates.

Three evidential boundaries govern the chapters that follow. First, results from India, Ethiopia, Brazil and Better Work's multi-country evaluation demonstrate mechanisms and magnitudes in their own settings. They are not Cameroon impact forecasts. Secondly, CICAM's reported plant utilisation, announced project capacities and illustrative garment scenarios use different denominators and different states of realisation. They must not be reconciled into a single synthetic baseline. Thirdly, a planning target is not an observation. Where the paper proposes a line gate, staffing cohort or pay structure, the proposal remains subject to practical testing and the sponsor's own verified data.

> **WARNING**
>
> The chapter does not provide investment, legal or tax advice. Wage rules, employer obligations and eligibility for incentives require current professional verification before implementation. The arithmetic shows which production assumptions decide unit cost; it does not establish a financing case or a guaranteed return.

The analytical task is therefore deliberately narrow. Retain the nominal wage information, but refuse to let it stand in for output. Measure standard work, attendance, efficiency and first-pass quality at the same line boundary. Fund the people who can act on those measures before scale multiplies their absence. Then test whether the real-

ised saving per good garment exceeds the full recurring cost of the capability. That is how a wage screen becomes an operating decision without confusing hope with evidence.

A low wage prices the hour; supervision determines what the hour produces.

CHAPTER SOURCE NOTES

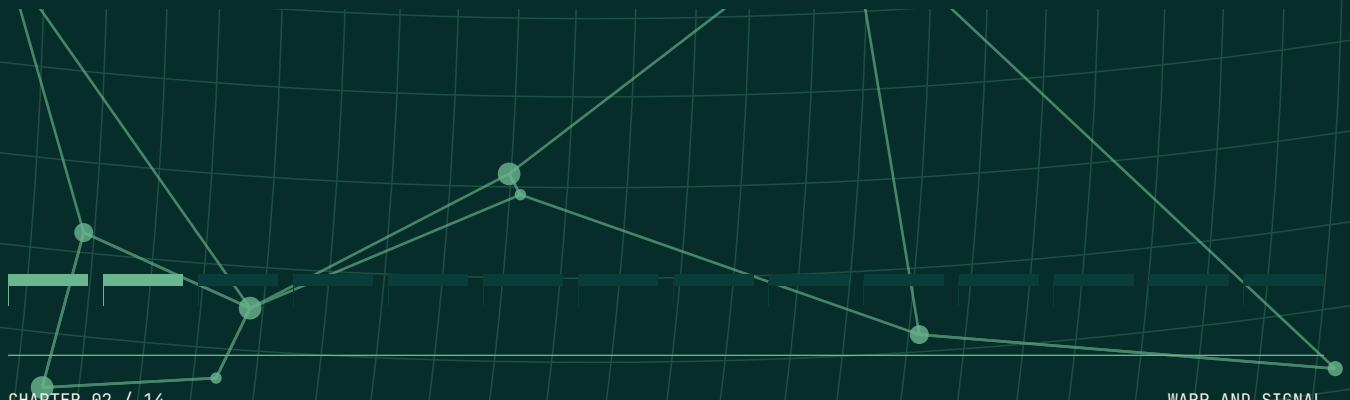
R14 WageIndicator. Publication date unrecorded; inherited source-text check.
R17 just-style. Publication date unrecorded; inherited source-text check.
S28 Center for Global Development. 2017-10-15.
S11 Roskilde University Centre for African Economies. 2017.
R15 wage.is. Publication date unrecorded; inherited source-text check.
S05 International Labour Organization. 2024-05-15.
R16 WageIndicator. Publication date unrecorded; inherited source-text check.
S06 International Labour Organization. 2019-08-26.
S29 World Bank Blogs. 2025-11-19.
S30 The World Bank Economic Review, Oxford University Press. 2025.
R11 Business in Cameroon; MMI News. Publication date unrecorded; inherited source-text check.
R12 Business in Cameroon. Publication date unrecorded; inherited source-text check.
R13 Business in Cameroon; MMI News. Publication date unrecorded; inherited source-text check.
R09 Ecofin Agency. Publication date unrecorded; inherited source-text check.
R10 Ecofin Agency. Publication date unrecorded; inherited source-text check.
S02 National University of Singapore Department of Economics. 2021-10-06.
S04 National Bureau of Economic Research. 2019-05.
S25 National Bureau of Economic Research. 2011-01.
S26 Innovations for Poverty Action. 2013-02-03.
S20 International Labour Organization and International Finance Corporation Better Work. 2016.
S21 International Labour Organization. 2024-12-05.
R06 Cameroon Trade Hub. Publication date unrecorded; inherited source-text check.
R07 Ecofin Agency. Publication date unrecorded; inherited source-text check.
R18 Congressional Research Service IF10149; AGOA (Wikipedia). Publication date unrecorded; inherited source-text check.

02

PART I · THE WAGE-PRODUCTIVITY PARADOX AND THE SUPERVISORY BOTTLENECK / CHAPTER 02 · THE LABOUR MARKET BASELINE

Ninety Percent Informality Starves Greenfield Plants of Industrial Floor Conditioning

Cameroon has a young, literate and abundant workforce, but the 2014 baseline of almost nine in ten workers in informal employment means that a greenfield factory must engineer industrial time discipline and supervisory capability rather than assume them.



CHAPTER 02
DECISION TEST

Cameroon has a young, literate and abundant workforce, but the 2014 baseline of almost nine in ten workers in informal employment means that a greenfield factory must engineer industrial time discipline and supervisory capability rather than assume them.

Cameroon can supply a greenfield garment plant with a large pool of young applicants, but that pool does not arrive with an industrial operating system already installed. The binding gap is not intelligence, willingness to work or manual potential. It is the scarce experience of paced, interdependent production: arriving for a fixed shift, repeating one operation to a measured standard, responding to a bundle signal, accepting technical correction and coordinating through a line supervisor. Almost nine in ten Cameroonian workers were in informal employment in the 2014 baseline reported by the ILO. [S42] A sponsor should therefore treat industrial conditioning as a production workstream, staffed and measured before launch, not as an induction speech after recruitment.

This diagnosis is not a judgement on informal workers. Own-account trade, smallholder production and workshop apprenticeships can develop commercial judgement, dexterity, endurance and practical problem solving. The deficit arises because those capabilities are organised around different signals from a progressive-bundle garment line. GFT's answer is to recognise useful prior learning, test the specific requirements of industrial work and provide paid practice under supportive supervision. The hiring question changes from whether an applicant has held a formal job to whether the factory can observe, develop and retain the required behaviour.

2.1

Demographic youth expands operator supply faster than supervisory depth

The demographic opportunity is substantial but dated observations must retain their dates. Cameroon's population was estimated at 23.8 million in 2018, with annual growth of 2.6 percent over 2010 to 2018. The ILO report records a median age of 17.7 years and 64.2 percent of the population below age 25, using the underlying source periods identified in its text. [S42] These figures describe a deep future labour pool. They do not describe the number of applicants available at a particular factory gate, their transport access or their readiness for industrial employment.

Youth literacy improves the case for structured technical instruction. The reported literacy rate for people aged 15 to 24 increased from 73.4 percent in 2004 to 81.8 percent in 2011, while gross primary enrolment stood at 109 percent in 2018. [S42] Literacy supports bundle tickets, safety instructions, defect codes and simple production records. It does not prove numerical fluency, machine control or the ability to interpret a standard minute. Recruitment should test those capabilities directly rather than infer them from school attendance.

The younger labour-market cohort is also large relative to total supply. People aged 16 to 35 represented 57 percent of Cameroon's labour force in the policy evidence published in 2024, and the same source reports that nearly 70 percent of young labour-market entrants had no professional qualification. [S41] The age bands differ from the literacy statistics and should not be merged into one synthetic profile. Together, they nevertheless separate two propositions that business plans often conflate: many people can apply for entry work, and far fewer arrive with a certified occupational route.

A young applicant can learn an operation quickly while still being unable to supervise a line. Supervision requires a wider time horizon. The supervisor compares operations, anticipates starvation and blockage, diagnoses whether a delay comes from skill, machine condition or material flow, and corrects an adult without destroying cooperation. Those judgements are built through exposure to normal shifts and exceptions. A demographic bulge supplies candidates for that development process; it does not compress the process into a recruitment weekend.

This distinction changes the recruitment funnel. Operator selection can emphasise safety, learning response, hand control, visual checking, basic numeracy and reliability. Supervisor selection must additionally sample explanation, prioritisation, fair correction and the interpretation of production evidence. Using the same short sewing test for both would select for the operation the factory can most easily teach while missing the judgement it most urgently needs.

The urbanisation outlook increases the strategic importance of this preparation without solving it. The United Nations projection reported by the Cameroon Economic Policy Institute expects 70 percent of Cameroonians to live in urban areas by 2050. [S41] A projection is not a current headcount or a guaranteed local recruitment radius. It indicates that industrial employers and training institutions should plan for larger urban labour catchments, while still addressing transport, housing, shift access and competing informal opportunities.

GFT therefore treats youth as a reason to invest in a repeatable conditioning system, not as evidence of immediate readiness. The proper planning output is a sequence of observed gates: applicant to assessed trainee, trainee to independent operator, operator to polyvalent operator, and only then suitable candidate to supervised leadership practice. Each gate answers a different question. A single count of young applicants answers none of them.

2.2

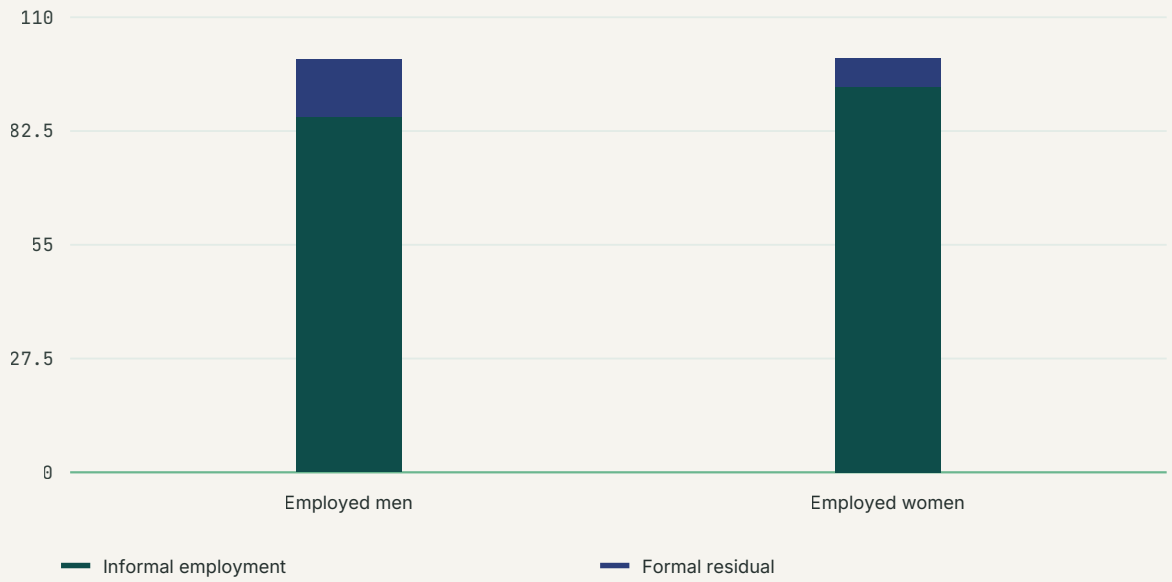
Informality changes the employment signals to which recruits have learned to respond

The most precise national anchor is the ILO's report of 2014 conditions: the informal sector accounted for 89.5 percent of employment, covering 86.0 percent of employed men and 93.2 percent of employed women. Informal agriculture represented 48.6 percent of total employment and informal non-agricultural activity 40.9 percent, while industry employed 13.4 percent of the working population. [S42] The industrial share overlaps the formality classification. It must not be added to the informal shares as though these were mutually exclusive categories.

The sex difference matters for plant design, but not as a stereotype about ability. **Exhibit 5**, p. 33 shows the reported informal shares and the formal residuals calculated within each employed sex group. It indicates how differently formal employment systems had touched men and women in the observed baseline. A garment plant that offers predictable pay, safe machines, respectful supervision and a visible technical promotion route can widen access, but it must audit whether its own selection and working conditions actually do so.

EXHIBIT 05 / PERCENT OF EMPLOYED PEOPLE WITHIN EACH SEX GROUP

Informality covered 93.2 percent of employed women and 86.0 percent of employed men in 2014



DERIVED [S42] Sourced informal shares from the 2014 ECAM results reported in S42. Formal residual is GFT arithmetic: men 100 - 86.0 = 14.0 percent; women 100 - 93.2 = 6.8 percent. Each bar totals 100 percent within its sex group. This is a dated national employment composition, not a GFT workforce profile or a 2026 estimate.

Underemployment adds another dimension. The same ILO synthesis reports overall underemployment of 77.6 percent in 2014, reaching 86.9 percent among women and 85.8 percent in rural areas. Broad urban unemployment was about 10.2 percent against 2.7 percent in rural areas. [S42] Low open unemployment therefore cannot be read as a lack of interest in formal factory work. Nor can underemployment be read as a reserve of instantly available full-time operators. People may be combining income activities, family obligations and seasonal work that a fixed shift would rearrange.

The industrial transition is consequently a change in the organisation of time and income, not simply a change of employer. The inherited labour register records a standard 40-hour week and a 48-hour maximum in Cameroon. [R16] Within those legal boundaries, the factory sets an actual shift calendar, break routine and attendance protocol. A recruit moving from own-account work must plan around a schedule that cannot simply follow customer footfall, harvest timing or family needs. The employer should make that schedule predictable and explain it before acceptance, rather than discover the mismatch after training expenditure.

Interdependence is an even sharper change. A trader can often pause one sale without stopping another trader. A sewing operator's delay can starve the next station or create a pile of work in progress. Fixed breaks, start signals and escalation rules exist because the line is a connected system. Conditioning should explain that physical mechanism. Rules taught only as discipline can appear arbitrary; rules demonstrated through bundle flow become a way to protect colleagues' time and output.

Informal experience can still be an asset inside this system. An own-account worker may understand customer promises, cash variability and the cost of wasted material. A small-workshop learner may already diagnose faults through sound, touch and sight. The factory should not erase those capabilities. It should connect them to shared measures: material waste to a recorded yield, customer promises to order flow, and fault intuition to a defined escalation and verification routine.

The workforce baseline also warns against confusing availability with attachment. A person can accept an industrial job because immediate income is necessary while intending to return to self-employment once conditions allow. This is a rational outside option, not a character flaw. Retention depends on the whole employment proposition: predictable earnings, manageable transport, physical safety, fair treatment, skill growth and a credible future beyond the entry operation. Informality explains why those features must be designed, but it does not predetermine any individual's choice.

2.3

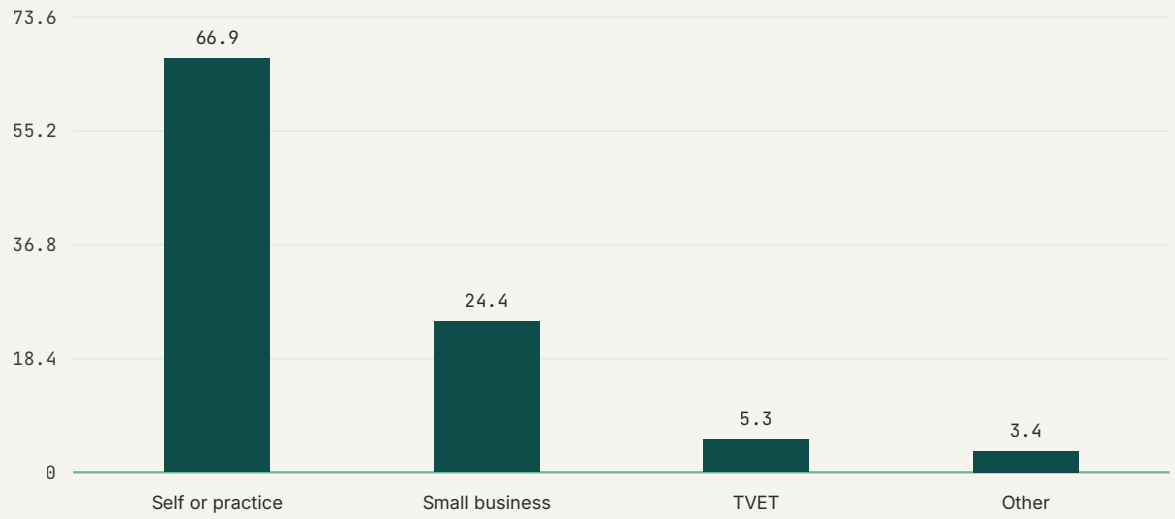
Artisanal tailoring and industrial sewing reward different control habits

The route by which workers acquired their last trade is a better recruitment clue than the informal label alone. In the NGATHE 2015 results reported by the ILO, 66.9 percent of employed informal workers had learned a trade on their own or through hands-on practice, 24.4 percent had trained in small businesses, and only 5.3 percent had learned through a TVET establishment. [S42] The figures describe learning channels, not competence levels. They show why a diploma-led recruitment filter would discard most of the experienced informal pool.

Exhibit 6, p. 35 preserves those three channels and calculates the unclassified remainder. Its practical lesson is that assessment should recognise prior learning while distinguishing its content. A candidate who can construct a complete garment may have excellent spatial understanding but no experience of a line-balanced operation. Another candidate without tailoring experience may learn a narrow operation rapidly and follow a visual standard with greater consistency.

EXHIBIT 06 / PERCENT OF INFORMAL WORKERS

Only 5.3 percent of employed informal workers learned a trade through a TVET establishment



DERIVED [S42] NGATHE 2015 results reproduced in S42. Self-directed or hands-on practice 66.9 percent, small businesses 24.4 percent and TVET establishments 5.3 percent. Other or unclassified is GFT residual arithmetic: 100 - 66.9 - 24.4 - 5.3 = 3.4 percent. The source categories describe how a trade was learned, not skill quality or current employment readiness.

A useful analytical contrast is between whole-garment control and divided-operation control. In GFT's illustrative whole-garment archetype, one maker chooses the next manipulation, adjusts the seam as the garment develops and carries the mental map of the complete item. In a progressive-bundle line, the operation breakdown distributes that mental map across workers and stations. Each operator must reproduce an assigned motion within a shared tolerance, then release the bundle so that the next operation can start on time. The first archetype rewards adaptive ownership of the whole; the second rewards repeatable ownership of a part within a visible sequence.

The Ethiopian shirt-line study makes the industrial scale concrete. Its existing system had 41 workstations, 35 assigned operators, a calculated cycle time of 33 seconds per unit and average line efficiency of 67.6 percent. [S31] These are case-study values, not Cameroonian standards. They demonstrate why a recruit's ability to sew a garment from start to finish is not the relevant test. The industrial question is whether the recruit can perform the specified operation at the required rhythm without compromising the next station.

This difference does not imply that experienced tailors must abandon their judgement. It implies that judgement must be applied at a new boundary. Freehand adjustment can be valuable when diagnosing a fabric fault or suggesting a better guide. It becomes harmful when an operator silently changes a seam allowance to compensate for a cutting problem, allowing defective panels to continue. Industrial conditioning teaches when to repeat the standard, when to stop and when to escalate the exception with evidence.

Machine familiarity needs the same separation. Pedal confidence on one machine does not establish control of a different needle system, feed mechanism, thread path or attachment. Nor does speed establish quality. Assessment should begin with safe threading and stopping, then measure stitch consistency and material handling, and only later introduce target time. Compressing these stages into one speed trial rewards unsafe habits and hides the specific coaching a recruit needs.

The factory should also test for unlearning without treating it as resistance. A recruit may need to replace a personal sequence with the engineered sequence, use a guide rather than align every edge by eye, or leave a bundle ticket attached rather than rely on memory. These are observable conversions. The trainer demonstrates the reason, the recruit practises the revised motion, and the assessor checks whether it persists after the exercise becomes repetitive.

> **GFT NOTE**
>
> Do not reject applicants because their experience is informal, and do not accept sewing experience as proof of industrial readiness. Use a paid practical assessment that separates dexterity, quality judgement, time discipline, response to correction and record keeping. Train the missing dimension and recognise the existing one. This turns informality from a crude screening label into a precise conditioning plan.

A well-designed conversion assessment therefore produces a training prescription rather than a single pass mark. One recruit may need machine-control practice but already inspect seams carefully. Another may sew accurately but struggle to sustain the shift rhythm. A third may have strong practical skill and need a route to formal recognition. Recording these profiles allows the factory to assign coaching time where it changes readiness, instead of giving every recruit the same classroom exposure.

2.4

Early turnover can consume the conditioning investment before lines stabilise

The first industrial months are a vulnerable transition, and comparative evidence shows why retention belongs inside the training model. In an experiment with five Ethiopian firms, applicants were randomised to an industrial job offer, an entrepreneurship programme or a control group. Industrial work offered more and steadier hours but low wages and risky conditions; most recipients quit within months, and the job offer had no effect on employment or income after a year. [S27] This is not a Cameroonian turnover forecast. It is evidence that access to a factory job does not by itself create durable industrial attachment. Roskilde research reaches a related skills conclusion: unskilled recruits in a new apparel sector often lack general factory experience, so firms must commit internal resources to basic-skills training. [S12]

The same experiment found that the entrepreneurship programme, comprising a US$300 grant and business training, raised earnings by 33 percent and provided steadier hours. [S27] The relevant mechanism is competition from a real alternative. Self-employment can remain attractive when it offers autonomy, a hoped-for earn-

ings path or a way to combine work with other obligations. A factory cannot train that alternative away. It must make the industrial proposition understandable and worthwhile while avoiding promises that the first payslip cannot support.

Expectation management begins before the first training session. Recruitment should show the actual workstation, noise, repetition, sitting or standing pattern, break arrangement and sample output standard. Candidates should hear how pay, attendance, probation and promotion work in plain language. A realistic preview may cause some applicants to withdraw early, but that is less costly than discovering the mismatch after a cohort has occupied machines and trainer time.

The Lao PDR garment study describes the resulting system risk as a low-equilibrium trap: worker dissatisfaction drives high turnover, which contributes to low capacity utilisation and weak investment in skills and productivity. It also records pressure and conflict with supervisors, sometimes intensified by cultural clashes with foreign male supervisors, among the reasons workers leave. [S24] The country and period differ from Cameroon today, but the feedback mechanism is portable as a management hypothesis to test: exits remove learned skill, replacements increase coaching load, and pressure on remaining staff can create further exits.

Turnover is therefore not only a human-resources rate. It changes the production denominator. Every departure removes part of the factory's accumulated practice and may introduce a novice into an interdependent station. If the line supervisor absorbs replacement coaching without additional time or support, daily control deteriorates. If the supervisor instead protects output by assigning the novice work beyond demonstrated competence, defects and stoppages move downstream. Conditioning capacity must include this replacement load rather than assuming a stable cohort.

Supervisory behaviour is one controllable part of attachment. Better Work's multi-country assessment links supervisory skills, workplace dialogue and reduced intimidation with performance, and reports that one in five factory managers considered stress among line supervisors a major obstacle to business success. [S20] A greenfield plant should not wait for conflict to reveal that a technically capable supervisor cannot coach. Observation of correction, huddles and worker response belongs in supervisor certification from the beginning.

The measurement system should distinguish several events that a single attrition percentage conceals: withdrawal during assessment, exit during basic training, absence immediately after placement, resignation after the first pay cycle, and loss of a trained operator to another employer. Each has a different cause and remedy. Early expectation mismatch calls for better previews and selection. Transport or pay problems require an employment response. Coaching failure requires supervisor development. A later promotion or poaching loss requires a different retention decision from a first-week quit.

GFT's practical conclusion is to track cohort survival alongside time to standard and first-pass quality. A training course that graduates many people who soon leave has not created industrial capability. Conversely, a slower course that produces stable, safe and improving operators may be the better production investment. The sponsor should judge conditioning by retained competence on the floor, not by attendance certificates issued at the classroom door.

2.5

Industrial evidence confirms that hiring does not finish the skills task

The need for post-hire development is visible even inside operational industrial parks. The ILO's Ethiopian assessment reports that about 54 percent of garment workers in industrial parks required additional skills support to reach the industry's operational standard. [S07] This is a finding about employed workers, not applicants rejected at the gate. It directly challenges the assumption that recruitment and basic induction are sufficient to establish an internationally comparable operation.

The same assessment identifies production management, planning and engineering, packaging and shipping, machine maintenance and repair, and design as the processes with the largest skills gaps. It also describes a weak, theory-heavy TVET system that has pushed firms towards in-house training. [S06] The severity differs by process. Basic sewing, stitching and cutting can be developed through structured internal instruction, while the diagnosis and coordination required by technicians and supervisors remain harder to supply. A greenfield plan should budget for that uneven difficulty.

Cameroon's own corporate-training baseline reinforces the point. In the 2012 business survey reported by the ILO, only 39.1 percent of companies had a staff training programme, with rates of 31.8 percent in primary activities and 42.4 percent in tertiary activities. [S42] These are dated survey results across companies, not a measure of every present employer. They nevertheless warn against assuming that recruits will have experienced systematic workplace instruction even where they have held previous jobs.

Comparative figures must retain their evidentiary boundary. Ethiopia's 54 percent is not a predicted deficit rate for a Cameroonian cohort, and Cameroon's company-training share does not measure garment-specific competence. Their value lies in the consistent operating conclusion: the employer becomes part of the skills-production system. The local recruitment diagnostic must then establish the actual starting point rather than import a percentage from another country. [S07] [S42]

Exhibit 7, p. 39 converts that conclusion into an illustrative curriculum-priority map. It does not claim measured severity scores. It distinguishes routine execution, exception diagnosis and the ability to develop others, because these capabilities require different evidence and different lengths of guided practice.

EXHIBIT 07 / ILLUSTRATIVE GFT CURRICULUM-PRIORITY SCORE FROM 1 TO 5

Judgement-intensive roles need deeper conditioning than routine task execution

	Execute task	Diagnose exception	Develop others
Sewing operations	3	3	4
Line supervision	4	5	5
IE and planning	4	5	5
Machine maintenance	3	5	4
Packing and shipping	2	3	3
Garment design	3	4	4

Cell scale: 2 to 5

ILLUSTRATIVE [S06] [S07] [S08] [S42] Illustrative GFT instructional-design model, not survey measurements. Score 1 means a short familiarisation module; 2 means repeated routine practice; 3 means independent execution with checks; 4 means guided diagnosis across varied cases; 5 means extended mentored judgement and verified coaching. The placement reflects the process gaps identified in S06, the post-hire support finding in S07, the occupational distinctions in S08 and the Cameroon learning-channel evidence in S42. Scores indicate training depth, not worker worth or national skill levels.

The map prevents a common budgeting error: treating every role as a variation of operator induction. A quality or maintenance technician needs exposure to faults that may not appear during a short classroom course. A supervisor needs to make and defend decisions under time pressure. A trainer needs to observe a learner's error and choose an effective correction. Assessment must reproduce those demands, otherwise the factory certifies recognition of content rather than performance at work.

GFT's conditioning architecture therefore separates four evidence gates. Knowledge checks establish whether the recruit understands safety and the operation standard. Controlled exercises establish whether the recruit can execute it. Live supervised production establishes whether performance survives real flow and interruptions. Finally, retention and transfer checks establish whether the person still performs after coaching is reduced and can help another worker learn. The detailed timetable can vary by role; the evidence sequence should not.

Each gate needs a failure route. A recruit who fails safe machine control returns to a defined exercise, not to production. An operator who meets time but creates defects receives method correction rather than a speed incentive. A supervisor candidate who can calculate a balance but humiliates a novice has not passed leadership. These rules make the conditioning system a protection for both worker and line, rather than a filter that simply moves weak performers out of sight.

The resulting records become part of production control. Training profiles identify which operations can be staffed independently, where coaching is still required and which supervisor owns the next gate. This is the human counterpart of the Perform-

ance-Management System: the line plan sees certified capability rather than nominal headcount. It also allows the factory to test whether its training actually reduces time to standard, defects and early exits across successive cohorts.

2.6

The scarce occupational layer coordinates the operator majority

An ILO-reported occupational benchmark for Ethiopian textile and garment firms gives average workforce shares of 4.4 percent managers, 8.7 percent technicians, 45.9 percent skilled production workers, 20.3 percent unskilled production workers and 16.3 percent non-production workers. [S08] Managers and technicians together represent 13.1 percent by direct addition. This is an occupational reference, not a prescribed factory organogram, and managers should not be treated as interchangeable with line supervisors.

The listed categories total 95.6 percent, so they should not be forced into a neat 100 percent pyramid without checking the underlying classification. That imperfection is useful discipline for workforce modelling. It reminds the analyst that occupational averages can omit categories or carry rounding and classification differences. The purpose here is narrower: to show that a large production group depends on a much smaller layer of managerial and technical coordination. [S08]

The Ethiopian skills assessment identifies why that layer is difficult to replace. Production management and supervision set the operating rhythm; planning and industrial engineering translate demand into balanced work; maintenance protects machine availability; packaging and shipping protect order completion; design converts product intent into manufacturable instructions. [S06] An operator majority cannot compensate for persistent failure in those coordinating tasks simply by working faster at isolated stations.

The scarcity is multiplicative rather than merely numerical. One weak technician can affect several lines, and one unprepared supervisor can shape the daily experience of an entire team. Recruiting these roles late also creates a sequence problem: operators may be ready before anyone can set fair standards, control quality or respond to exceptions. The plant then carries trainee payroll without having the leadership required to convert it into good output.

> **WORKED EXAMPLE: SCALING AN OCCUPATIONAL BENCHMARK DOES NOT SCALE READINESS**
>
> Apply the cited occupational shares to an illustrative 900-person workforce solely to see the order of magnitude. Managers would be 900 × 4.4 percent = 39.6 people, technicians 900 × 8.7 percent = 78.3 people, and the combined layer 900 × 13.1 percent = 117.9 people, or about 118 before rounding. Skilled and unskilled production shares together would imply 900 × 66.2 percent = 595.8 people, while non-production staff would imply 900 × 16.3 percent = 146.7 people. These expected values come from S08 and do not sum to 900 because the source categories total 95.6 percent. They are not GFT staffing commitments or a recommendation to create 118 supervisors. [S08]

The worked example demonstrates why the smaller layer needs a separate pipeline. Advertising for hundreds of operators and using the same channel for technical coordination would obscure both scarcity and role content. The plant needs a role map that distinguishes line leadership, industrial engineering, maintenance, quality and management, then identifies the prior experiences that could feed each route. It also needs succession depth so that one absence or resignation does not remove an entire diagnostic capability.

Development time should reflect the evidence required, not a uniform course duration. A narrow operation can be assessed through repeated execution. Supervisory and technical judgement requires exposure to varied styles, absence patterns, machine faults, material problems and quality disagreements. GFT therefore plans operator conditioning and leadership conditioning as connected but distinct tracks, with the second drawing on observed performance in the first rather than relying solely on external credentials.

This is the industrial-conditioning deficit in its complete form. Cameroon can supply people for the production majority, but a greenfield venture must simultaneously create the coordination layer that makes that majority productive. A staffing plan is credible only when it shows both pipelines, their assessment evidence and the point at which each person is allowed to make decisions without supervision.

2.7

Promoting the fastest operator confuses dexterity with supervisory capability

The fastest sewer is an attractive promotion candidate because the evidence is immediate and easy to count. Yet the promotion changes the unit of performance. The operator succeeds by completing a personal operation to standard. The supervisor succeeds by making a group of interdependent operations perform together. Speed at the first task provides no direct evidence of balancing, coaching, escalation or fair decision making in the second.

A supervisor must also switch attention across different causes. A slow station may reflect a novice's handling method, a machine fault, poor cutting, an unclear specification or an absence elsewhere on the line. Each cause requires a different response and often a different owner. Promoting without training leaves the new supervisor to infer this diagnostic system while already carrying output pressure. The result can be arbitrary reassignment, repeated intervention without root correction, or pressure directed at the person rather than the process.

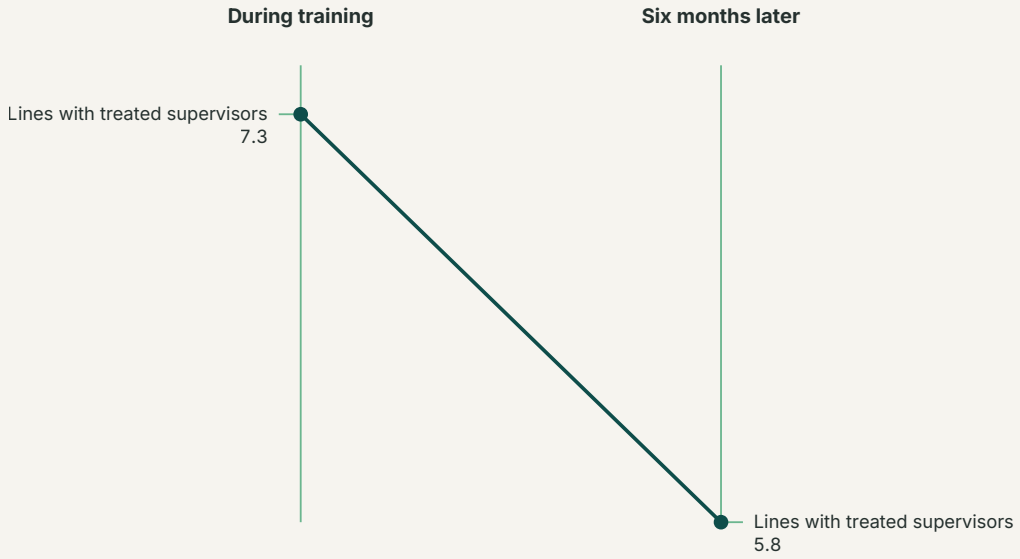
That pressure has operational consequences. Better Work reports that verbal abuse detracts from worker productivity and is associated with lower factory performance, while poorly trained supervisors may resort to shouting because they lack more effective management skills. [S20] The finding does not mean every promoted operator becomes abusive. It means the factory must teach and observe respectful correction as a technical management behaviour, not assume that personal sewing excellence will supply it.

Structured development offers a better route. Better Work reported a 22 percent productivity increase on lines overseen by Supervisory Skills-trained female supervisors relative to lines with supervisors who had not received that training. [S20] This multi-country result supports investment in defined supervisory behaviours. It is not a forecast of a 22 percent gain in Cameroon, and it does not establish an inherent advantage of one sex or nationality over another.

The STITCH randomised trial in an Indian garment firm provides a second, more granular result. Productivity on lines managed by treated supervisors rose by 7.3 percent during training relative to control and remained 5.8 percent higher six months after programme completion. [S02] **Exhibit 8**, p. 42 shows the persistence of that average effect. Its importance for greenfield conditioning is that supervised practice changed subsequent line performance beyond the classroom period.

EXHIBIT 08 / PERCENT CHANGE IN LINE PRODUCTIVITY RELATIVE TO CONTROL

The average STITCH productivity gain persisted at 5.8 percent six months after training



SOURCED [S02] Sourced average treatment results from the 2021 STITCH randomised trial in an Indian ready-made garment firm: 7.3 percent during training and 5.8 percent six months after programme completion, both relative to control. The two points are average effects over the study periods, not the trajectory of one line and not a Cameroonian forecast.

The trial also challenges subjective nomination. Lines managed by supervisors highly recommended by factory and floor managers showed nearly zero productivity impact from training, while lines managed by supervisors with low recommendation rankings showed impacts above 11 percent. [S03] The researchers' interpretation includes a retention incentive: middle managers bore private replacement costs and appeared to prioritise retention when recommending candidates. [S02] A nomination can therefore contain useful information yet still pursue a different objective from maximising training productivity.

GFT's selection response is to create common, observed trials. Candidates explain a defect using a physical sample, interpret a short station record, rebalance a simulated absence, complete a production log and coach a peer through an error. Assessors

score the same behaviours with explicit anchors. Sewing performance remains relevant as technical context, but it cannot compensate for unsafe judgement, hostile correction or inability to organise the line.

The final rule closes the chapter's labour-market argument. Do not ask the informal economy to deliver ready-made industrial supervisors, and do not confuse its absence of diplomas with an absence of learning potential. Build a conditioning system that recognises prior skill, creates factory discipline through explained practice, supports the first employment transition and selects leaders through observed judgement. The greenfield plant then manufactures supervisory depth alongside garments rather than hoping that demographic abundance will produce it by default.

Industrial capability begins when potential is given a standard, a practice floor and a fair route to lead.

CHAPTER SOURCE NOTES

S42 International Labour Organization (ILO). 2020.

S41 Cameroon Economic Policy Institute (CEPI). 2024.

R16 WageIndicator. Publication date unrecorded; inherited source-text check.

S31 Hawassa University (Ethiopian Journal of Engineering and Technology). 2023.

S27 American Economic Association (AEJ: Applied Economics). 2018-07.

S12 Roskilde University Centre for African Economies (CAE). 2017.

S24 World Bank. 2012.

S20 ILO and IFC Better Work. 2016-09.

S07 International Labour Organization (ILO). 2019-08-26.

S06 International Labour Organization (ILO). 2019-08-26.

S08 International Labour Organization (ILO). 2019-08-26.

S02 National University of Singapore Department of Economics (STITCH). 2021-10.

S03 National University of Singapore Department of Economics (STITCH). 2021-10.

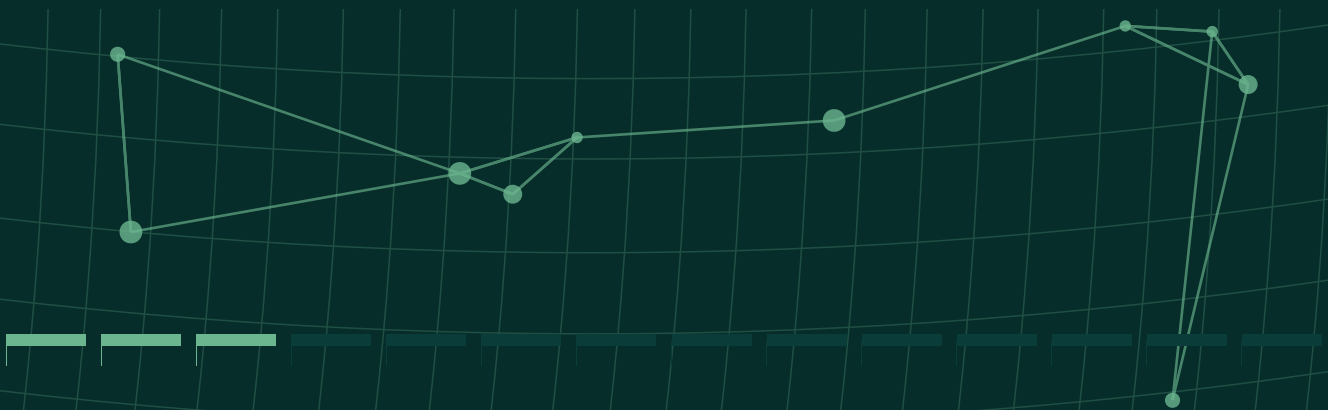
GREEN FUTURE TECH

LIMITED / HONG KONG SAR

03

The Expatriate Supervisor Trap Erodes Margin and Triggers Floor Attrition

Importing large permanent cohorts of foreign floor bosses to run African garment lines inflates fixed overhead, blocks local capability building and provokes shop-floor disputes that drive operator turnover.



CHAPTER 03
DECISION TEST

Importing large permanent cohorts of foreign floor bosses to run African garment lines inflates fixed overhead, blocks local capability building and provokes shop-floor disputes that drive operator turnover.

Permanent expatriate supervision is a poor operating model for a greenfield African garment factory. It can be a sound temporary bridge when local technical experience is absent, but it fails when imported experts remain the permanent line authority. The trap has three linked mechanisms: a hard-currency cost base that persists through slow ramps, local staff who observe decisions without acquiring the right to make them, and floor communication that turns routine corrections into conflict. GFT's answer is not to refuse foreign expertise. It is to buy a measured transfer of capability through a small mentor cohort, fixed handoff contracts and local deputies who progressively take real decisions.

The distinction matters because the first line supervisor must solve immediate production problems while the factory must also build its future supervision supply. A permanent commander optimises the first task and can quietly sacrifice the second. A mentor is accountable for both. This chapter therefore evaluates expatriation by cost per certified local leader and by the line's performance after the mentor leaves, not by the mentor's own output while still present.

3.1

First-wave apparel parks imported supervision because the scarcity was real

New apparel parks face a genuine timing problem. Buyers require consistent quality and delivery before a local cohort has accumulated years of sewing-line experience. Ethiopian sector research identifies inexperienced managers, technicians and supervisors as constraints on productivity, while the country's apparel export development relied on foreign firms with established production routines. [S06] [S11] Importing experienced supervisors, mechanics and quality staff was therefore an operational response to scarcity, not an arbitrary preference.

The imported expert brings three assets that a greenfield plant cannot obtain from a recruitment advertisement. The first is a tested production routine: how to prepare a style, set a line and respond when output diverges. The second is diagnostic memory: the ability to connect a symptom such as seam puckering or rising work in progress with a probable cause. The third is credibility with buyers and senior managers during the fragile early ramp. These assets can shorten the period in which the factory is learning through expensive mistakes.

That case for temporary help does not establish a case for permanent command. The knowledge required to run one difficult style change is different from the organisational design required to run every shift for years. If the expatriate retains every consequential decision, the factory continues to purchase the same expertise rather than producing it internally. Low nominal wages then offer little protection: Ethiopian evidence shows that labour can remain expensive per unit of output when productivity lags, even where wage rates are low. [S11]

The appropriate scope for imported expertise is therefore narrow and explicit. Use it where an immediate error would create a larger loss than the cost of the mentor, such as initial line setup, machine commissioning, quality-system design or the first complex style. Do not use it as a permanent substitute for recurrent shift decisions that

local supervisors must eventually own. The test is not whether a foreign expert can perform the task better today. It is whether each assignment reduces the need for the same expert tomorrow.

A plant can make that test visible with a dependency register. For every critical routine, it records who detects the problem, who chooses the response, who authorises the response and who verifies the result. A local employee listed only as an observer is not yet a successor. A deputy who can detect and recommend, but still needs expatriate authorisation for routine action, is only partway through the transfer. The register converts an abstract localisation promise into a sequence of decision rights.

This also prevents a misleading headcount metric. A factory may report a rising local share of supervisory titles while expatriates still control targets, discipline, overtime and quality release. GFT treats the transfer as complete only when local leaders hold those decisions and the resulting line records remain within agreed control limits. Nationality itself is not the performance variable. Decision capability, communication and accountable ownership are.

3.2

Passive observation does not transfer supervisory capability

Field research in Ethiopia's foreign-owned textile and garment factories finds that firms tend to neglect training and technology transfer beyond what their immediate operations require. [S09] This is consistent with a simple production incentive. Basic induction helps an operator perform today's assigned operation. Developing a local supervisor requires time away from output, permission to make mistakes and a deliberate explanation of why a decision worked. A manager measured only on today's shipment can rationally postpone that investment.

The gap is not closed by proximity. A local graduate can stand beside an expatriate supervisor for months without learning how to balance a line if the expert merely issues instructions. The observer sees the final reassignment of operators, not the comparison of station times, absence patterns and skill records that produced it. The observer sees a mechanic replace a part, not the diagnostic branches that ruled out tension, timing and needle damage. Tacit knowledge remains hidden unless the expert externalises the reasoning and gives the learner controlled practice.

The resulting occupational ceiling is visible in wider African industrial research: most jobs created for national workers in the studied Ethiopian and Angolan firms were in low-skilled or semi-skilled categories. [S13] A promotion title alone does not break that ceiling. A local group leader who relays instructions but cannot change the line balance, reject a defective bundle or coach an operator remains in an administrative role while technical authority stays elsewhere.

Four design failures keep passive transfer in place. First, the expert receives no contractual deliverable for successor development. Second, the learner has no scheduled practice in which their decision has a real consequence. Third, mistakes by the learner

are treated as evidence of local incapacity rather than as training events with defined recovery limits. Fourth, records sit in the expert's personal notebook or messaging account, so institutional memory leaves with the contract.

GFT replaces observation with a deliberate practice cycle. The mentor first performs the task while narrating the decision rule. The deputy then repeats the task on a controlled case, explains the evidence aloud and receives correction. Next, the deputy leads a live shift within agreed limits while the mentor observes without intervening except for safety, legal or severe quality risks. Finally, the deputy teaches the same routine to another employee. Teaching exposes gaps that silent agreement conceals.

The assessment must sample decisions, not attendance. Useful evidence includes a deputy's written response to a simulated absence shock, a recorded huddle, a correctly diagnosed quality escalation and a shift log completed without mentor repair. The mentor's report should identify the decisions the deputy can make alone, those requiring consultation and those still prohibited. This creates a granular handoff rather than a binary claim that training has occurred.

> **GFT NOTE**
>
> Fund every expatriate assignment with two outputs: a stable production routine and a named local successor who can reproduce it. Pay for the second output only after observed practice, not after a certificate of attendance.

The transfer audit should also check who learns from exceptions. If an expatriate resolves every urgent problem privately, the local cohort sees only normal shifts. A short exception review can reconstruct the event without blame: initial signal, discarded hypotheses, chosen action, result and the rule to retain. The local deputy then writes the rule into the line standard. This makes each disruption add to factory memory rather than deepen dependence.

3.3

Permanent expatriate staffing converts a skills gap into fixed overhead

The relevant cost is not the expatriate salary printed in an offer letter. It is the fully loaded annual commitment: salary, housing, international travel, visas, insurance, subsistence, relocation, home leave and any translation or duplicated administration required to make the arrangement work. Research on Ethiopian textile and garment firms records that foreign technicians are expensive and that many domestic firms cannot cover this cost, limiting their access to technical knowledge. [S10] A greenfield business plan must therefore cost the complete dependency, not one payroll line.

For comparison, Cameroon's statutory minimum wage stood at XAF 43,969 a month from 23 February 2024, recorded as about US$76 in the inherited register, while the register's cross-sector average salary was about US$359 a month. [R14] [R15] The average is not a supervisory wage quote and the statutory floor is not a recommended supervisory salary. They simply show the scale mismatch when an illustrative expatri-

ate package of US$1,500 to US$3,500 a month is placed beside local labour benchmarks. The package range is an illustrative GFT modelling assumption, not a market salary survey.

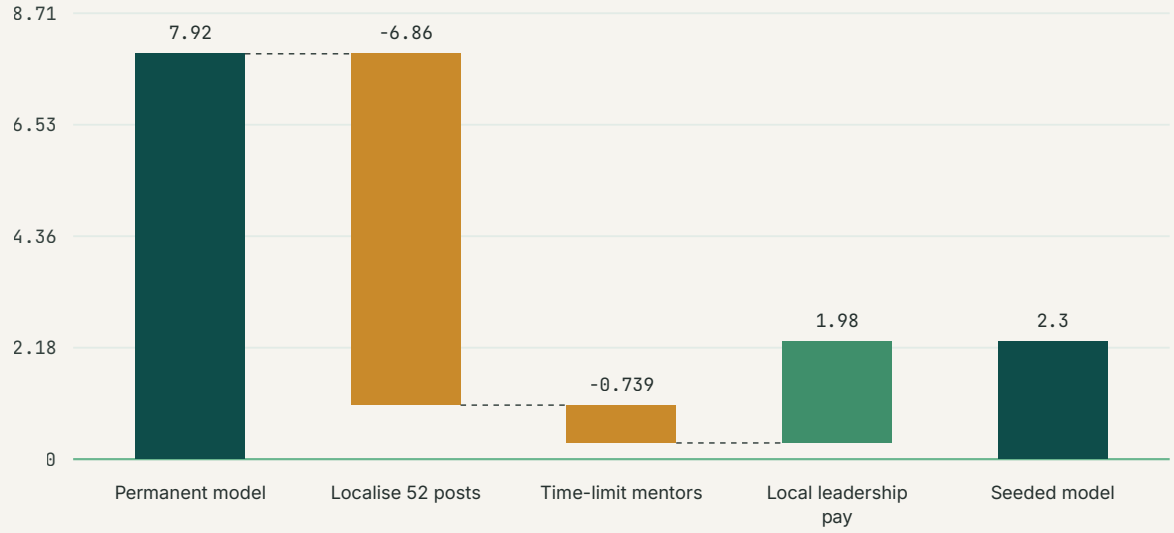
> **WORKED EXAMPLE: THE ANNUAL OVERHEAD COMPARISON**
>
> An illustrative 900-person factory assigns 36 line-supervision posts and 24 technician posts to 60 permanent expatriates at US$2,200 a month each. The annual cost is 60 × US$2,200 × 12 = US$1.584 million. At an illustrative conversion of XAF 600 per US dollar, that is XAF 950.4 million. By comparison, 720 local operators at the cited XAF 43,969 monthly SMIG floor would have annual base pay of 720 × XAF 43,969 × 12 = XAF 379.892 million. [R14] The expatriate commitment is therefore about 2.50 times that operator base-pay total. Both sides exclude different additional employment costs, so this is a scale comparison, not a complete profit-and-loss statement or an investment forecast.

The margin effect becomes more severe during a slow ramp because the expatriate commitment does not fall in proportion to good garments produced. A mentor cohort may be essential while output is low, but a permanent cohort keeps the same fixed cost when absenteeism, style changes or machine faults reduce the denominator. The apparent saving from cheap operator labour can then be absorbed before material, energy, logistics or financing costs are considered. This is an operating-design observation, not investment, legal or tax advice.

The alternative is not zero expatriate cost. It is a different cost shape. A seeded model buys a small amount of foreign expertise for a fixed transfer window and builds a local supervisory payroll that remains after handoff. **Exhibit 9**, p. 49 shows the arithmetic for an illustrative five-year comparison. The local supervisory band is deliberately above the cited cross-sector average to avoid implying that scarce leaders should be paid at the statutory floor. [R15]

EXHIBIT 09 / US$ MILLION, CUMULATIVE OVER FIVE YEARS

Localising supervision cuts illustrative five-year leadership cost by 71 percent



DERIVED [R14] [R15] [S10] Derived illustrative GFT model, not a salary survey or forecast. Permanent model: 60 expatriates × US$2,200/month × 60 months = US$7.920m. Localise 52 posts: -52 × US$2,200 × 60 = -US$6.864m. Shorten the remaining eight mentors from 60 to 18 months: -8 × US$2,200 × 42 = -US$0.7392m. Add 60 local leaders at an illustrative fully loaded US$550/month: +60 × US$550 × 60 = +US$1.980m. Seeded closing cost = US$2.2968m. Saving = (7.920 - 2.2968) / 7.920 = 71.0 percent. Local pay is a modelling band, not a GFT pay commitment.

Within that illustrative comparison, total five-year leadership cost falls by 71.0 percent, while expatriate-only expenditure falls from US$7.920 million to US$316,800, a reduction of 96.0 percent. The second percentage should not be confused with total factory savings: the plant now pays local leaders who were not part of the all-expatriate model. The useful decision variable is the combined cost of mentors, successors, training time and verified performance over the full handoff period.

Sensitivity should be tested before the model influences a budget. A higher local supervisory band reduces the saving but preserves the principle of a finite foreign commitment. A longer mentor contract increases cost and may indicate that the transfer method is failing. A shorter contract saves money only if successors pass the same practical gates. Comparing monthly salaries without these variables would reward premature exit or permanent dependence, depending on which cost was omitted.

GFT's preferred efficiency measure is therefore cost per independently certified local leader, accompanied by a post-handoff line result. The numerator includes mentor cost, local paid training time, assessment and remedial practice. The denominator counts only leaders who later run the defined shift without shadow command. This prevents a training department from reporting low course cost per attendee while the factory still imports the people who make the actual decisions.

3.4

Communication friction turns small production errors into attrition risk

A sewing line depends on rapid, specific correction. The useful message is often narrow: change the folder alignment, reduce the bundle size, check the second operation or stop the machine before another defective piece enters the flow. When supervisor and operator do not share enough working language, the message loses its technical content. Tone, gesture and hierarchy fill the gap. What should be a short process correction can then be received as a personal accusation.

Foreign nationality does not cause this failure by itself. A local supervisor can also shout, favour one operator or hide a weak standard. The risk rises when three conditions coincide: the supervisor lacks a shared working vocabulary, has received no coaching training and is judged on output without regard to method. Better Work evidence links supervisory skills and less intimidating workplace behaviour with improved line performance; its reported productivity result comes from trained supervision, not from a particular passport. [S20] [S23]

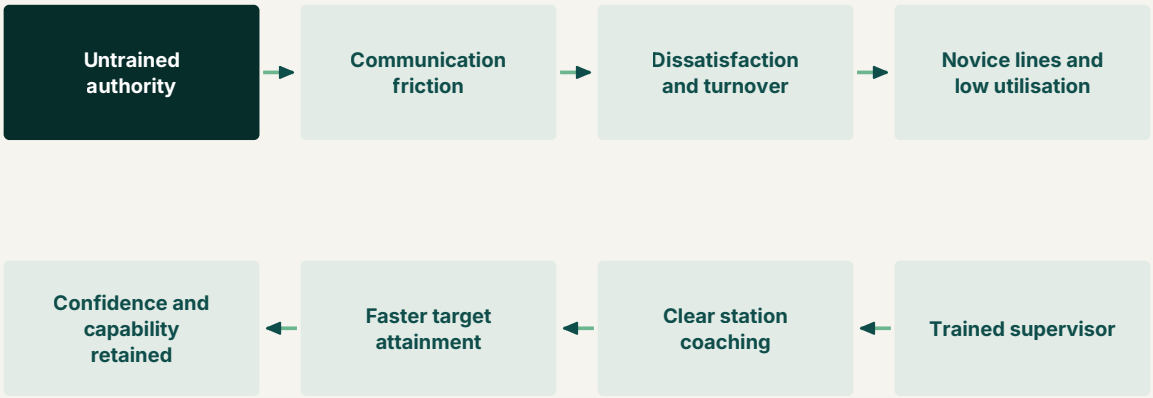
The World Bank's Lao PDR garment study describes a low-equilibrium trap in which worker dissatisfaction drives high turnover, which in turn contributes to low capacity utilisation and weak investment in skills and productivity. [S24] The important point for a greenfield plant is the feedback loop. Each resignation removes learned station knowledge. The replacement requires attention from the remaining experienced staff. If supervisors respond to the resulting output loss with more pressure, they intensify the conditions that produced the exit.

Attrition also has an outside-option mechanism. Ethiopian experimental evidence found that an entrepreneurship programme raised earnings and provided steadier hours, demonstrating that self-employment can be a meaningful alternative to industrial entry work. [S27] A factory cannot eliminate that alternative through authority. It can make industrial employment more coherent through predictable coaching, transparent standards and a visible route from operator to technical responsibility.

Exhibit 10, p. 51 separates the two feedback paths. It is a mechanism map, not proof that every expatriate-managed line follows the adverse path or every local-managed line follows the favourable one. Its purpose is to locate the points where management can interrupt the loop before turnover becomes the visible symptom.

EXHIBIT 10 /

Untrained authority and coached authority create opposite floor feedback paths



DERIVED [S20] [S23] [S24] Derived qualitative synthesis of the World Bank low-equilibrium turnover mechanism and Better Work supervisory-skills findings. The paths are hypotheses for floor monitoring, not estimated transition probabilities and not a claim that nationality determines behaviour.

The plant should measure friction without turning nationality into a human-resources proxy. Useful records include regretted exits by supervisor and tenure band, absence clusters after disciplinary events, grievance themes, the time taken to resolve a quality disagreement and whether operators can explain the instruction they received. Exit interviews need confidential channels because an operator who expects a supervisor to control references may not report intimidation accurately.

A practical language protocol reduces ambiguity at the point of work. The factory defines a small controlled vocabulary for operations, defects, machines and safety. Mentors use physical samples and teach-back: the operator demonstrates the required action rather than merely saying yes. During the transfer period, bilingual local deputies interpret technical meaning and check understanding. The objective is not to make interpretation a permanent parallel hierarchy, but to remove ambiguity while local decision capability develops.

The huddle adds a second safeguard. A supervisor discusses a defective seam against the physical standard and the station record, not against an operator's character. Operators can challenge a target by pointing to a machine condition, bundle imbalance or unclear specification. This converts disagreement into evidence that can be inspected. It also gives the mentor a direct way to audit whether the local deputy is reproducing respectful problem solving rather than copying an authoritarian style.

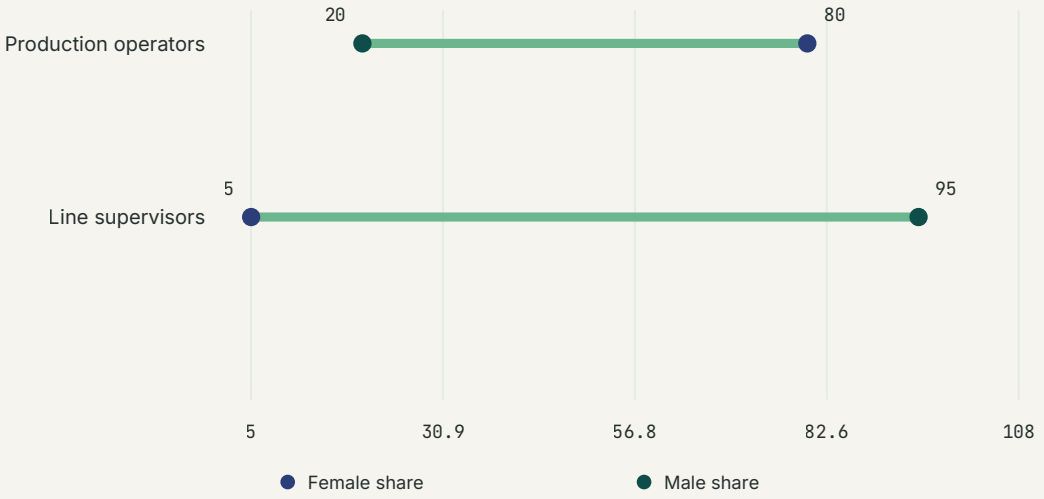
3.5

Gender asymmetry reveals a promotion-information failure

The garment benchmark examined by the University of Warwick team had nearly 80 percent female production-line workers but 95 percent male supervisors. [S01] That reversal cannot be explained by the supply of women on the line. It points to a selection process in which the people with direct sewing experience are not being converted into supervisory candidates at the same rate as men.

EXHIBIT 11 / APPROXIMATE PERCENT OF EACH ROLE'S WORKFORCE

The observed garment benchmark reverses gender representation above the operator tier



SOURCED [S01] Sourced from the study context reported in S01. For each role, female and male shares are complementary compositions, not before-and-after observations. The operator share is rounded because the source says nearly 80 percent. This is a Bangladeshi research setting, not a Cameroonian or GFT workforce statistic.

Exhibit 11, p. 52 should not be read as evidence that women are inherently better supervisors or that an imported male supervisor cannot coach women effectively. Its diagnostic value is narrower: promotion based on untested beliefs can exclude a large part of the available talent pool. The Warwick experiment used training and practical exposure to examine and correct those beliefs, making the selection process itself an object of industrial engineering. [S01]

The Cameroonian labour-market baseline makes fair internal selection especially important. In the 2014 figures reported by the ILO, 93.2 percent of employed women were in the informal sector, compared with 86.0 percent of men. [S42] These are dated national observations, not the composition of a future garment plant. They indicate why a formal technical promotion pathway can matter, but they do not justify assuming any individual candidate's experience or ability.

GFT therefore treats supervisor selection as an auditable funnel. Every eligible operator receives the same information about the role and the same access to a practical assessment. The assessment samples station knowledge, arithmetic, communication, error response and the ability to explain a standard. Personal recommendations can

nominate a candidate, but cannot substitute for observed performance. Selection records show the eligible pool, applicants, assessors, trial participants and successful candidates by sex.

A paid trial period supplies the evidence that interviews miss. The candidate leads defined parts of a shift, conducts a huddle and resolves a controlled bottleneck while the current supervisor observes. Assessors score the same behaviours with the same anchors. Candidates receive specific feedback and a route to retry after practice. This prevents one nervous huddle or one manager's impression from becoming a permanent exclusion.

The final safeguard is an appeal route outside the immediate line hierarchy. Workers need a way to report biased allocation, humiliation or retaliation without having the accused supervisor control the complaint. The factory should examine selection rates and trial outcomes, then investigate large differences for process causes. The objective is not a demographic target detached from competence. It is equal access to the evidence through which competence becomes visible.

3.6

Measured training gains support local promotion without inventing a nationality effect

The strongest counterargument to permanent expatriate command is not a claim about where a supervisor was born. It is the measured effect of structured supervisory development. Better Work reported that lines overseen by trained supervisors achieved a 22 percent productivity increase relative to lines with untrained supervisors, with trained supervisors reducing the time needed to reach production targets. [S20] The ILO's account specifies that the comparison involved Supervisory Skills-trained female line supervisors and supervisors who had not yet received that training. [S23]

The result should be interpreted precisely. It does not show that female supervisors are naturally 22 percent more productive, that local nationality produces the gain, or that a new Cameroonian factory should copy the percentage into its forecast. It shows that a defined training intervention coincided with a large measured improvement in the studied settings. The operational lesson is to reproduce the trainable behaviours and then measure the local result under comparable definitions. [S20] [S23]

A separate garment-sector experiment reinforces that interpretation. Lines managed by treated supervisors increased productivity by 7.3 percent during training relative to control lines and remained 5.8 percent higher six months after programme completion. [S02] The persistence matters for workforce design. Training did not merely create a one-off classroom response; it changed subsequent line management. A mentor contract should likewise be judged by what remains after the mentor stops directing the shift.

Selection determines whether the factory captures that benefit. In the same research stream, supervisors highly recommended by factory and floor managers showed nearly zero measured productivity impact from training, while those with low recommendation rankings showed impacts above 11 percent. [S03] This is a warning

against letting incumbent managers, whether expatriate or local, choose only the people who already resemble their idea of authority. Practical diagnostics and open trials can reveal candidates whom subjective ranking suppresses.

The content of training explains why local promotion is plausible. Better Work describes hands-on exercises, group discussion and individual reflection covering worker rights, supervisor responsibilities and professionalism. [S22] These behaviours can be demonstrated and assessed. They are not a scarce genetic or national trait. A local candidate who already understands the operators' working language and has performed the station tasks may bring useful context, but that context must still be combined with technical balancing, quality judgement and respectful control.

GFT's localisation case is therefore conditional. Promote from within because the factory can create a fair, measured route to supervisory competence, not because local appointment is automatically cheaper or calmer. If a local candidate cannot yet control the line, the remedy is structured practice with a mentor, not permanent exclusion. If an expatriate candidate is the best available mentor, the contract should make that expertise reproducible rather than make the line dependent on it.

3.7

A time-bound mentor contract must purchase verified handoff

GFT's illustrative workforce model replaces 60 permanent expatriate supervisory and technical posts with eight master mentors and 60 local supervisory and technical roles over an 18-month handoff. The mentors are not assigned as hidden line commanders. Each works with two primary local deputies at a time, while those deputies cascade standards to the wider cohort. The model is a planning case, not a claim about an existing GFT factory or a promise that every skill can transfer on the same schedule.

The contract begins by naming the capability to be transferred. A master line supervisor may own style preparation, huddle facilitation, absence rebalancing and hourly exception control. A chief mechanic may own fault diagnosis, preventive maintenance and repair verification. A senior industrial engineer may own time study, operation breakdown and line balancing. Each responsibility needs a practical assessment, a reference standard and a local decision boundary. Generic duties such as supporting production or sharing experience are not sufficient.

An illustrative handoff has four stages. During months zero to three, the mentor leads and narrates while deputies complete controlled exercises. During months three to six, deputies lead defined routines and the mentor corrects them. During months six to twelve, deputies run whole shifts with the mentor observing and auditing. During months twelve to eighteen, local leaders operate without shadow command while mentors investigate residual gaps and verify repeatability. Progression follows evidence, so a calendar date alone cannot move a weak deputy to the next stage.

Decision rights must move explicitly at each stage. The handoff record states who can change a station assignment, stop a defective operation, authorise a machine swap, approve rework and close the daily log. If the mentor continues to issue these instruc-

tions through informal messages after formal delegation, the audit records the dependency rather than pretending the transfer has occurred. This protects both parties: the deputy knows the boundary and the mentor is not blamed for a decision they no longer control.

Completion pay should reward the same outcome as the factory needs. An illustrative bonus gate requires each nominated deputy to pass practical line-balancing, maintenance-response and huddle audits appropriate to the role, followed by the line holding its agreed first-pass-yield and output control limits for 60 consecutive shifts under local leadership. The control limits are style-specific and set before the observation window. The gate is not a claim that one stable period proves every future style will perform identically.

Exhibit 12, p. 55 sets the conventional permanent model beside this transfer contract. The comparison is intentionally about authority and incentives, not simply headcount. A small expatriate cohort can still fail if mentors receive bonuses for personal output while deputies remain observers.

EXHIBIT 12 / ILLUSTRATIVE GFT CONTRACT SPECIFICATION

A mentor contract buys successor capability rather than permanent command

Contract dimension	Permanent expatriate model	Seeded mentor handoff
Primary role	Run the line indefinitely	Build routines and successors
Illustrative staffing	60 expatriate leaders	8 mentors plus 60 local leaders
Time boundary	Open-ended renewal	12 to 18 months with evidence gates
Local decision rights	Delegated case by case	Scheduled transfer with signed register
Practice method	Observation beside the expert	Demonstration, controlled practice, independent shift
Language protocol	Interpreter added after conflict	Controlled vocabulary and teach-back from launch
Completion incentive	Personal output and contract renewal	Deputy certification and stable local-led line record
Exit test	No defined local handoff	Local shift passes without shadow command

ILLUSTRATIVE Illustrative model for a 900-person greenfield factory. Headcounts, durations and gates are planning assumptions, not current GFT staffing, achieved localisation or contractual commitments. Local leaders must pass the same practical standard before authority transfers.

A renewal should be an exception with a diagnosis. If the line is stable but the deputy has not assumed authority, the mentor's method or incentives may be at fault. If the deputy can explain the routine but fails under live pressure, more supervised practice may be justified. If machine instability or material shortages prevent a fair test, the factory should fix those constraints rather than declare a local capability failure. Each renewal names the missing evidence, the corrective action and the next assessment date.

Premature handoff is the opposite failure. Removing mentors before local leaders can control quality, safety and delivery would merely replace expensive dependence with avoidable disruption. The exit decision therefore requires three independent signals: the local leader performs the practical assessment, the line record remains within its agreed limits and operators can confirm that instructions and escalation routes are clear. A sponsor should not waive these signals to meet a presentation date.

> **HANDOFF EVIDENCE PACK**
>
> For each critical role, retain the capability matrix, observed assessments, decision-rights register, exception reviews, line control record and signed exit decision. Review a sample of shifts where the mentor was physically absent. The evidence pack should demonstrate independent judgement, not only good performance while the expert was nearby.

The final commercial test comes after exit. Compare the local-led line with its own pre-handoff baseline using the same style family, shift length, product mix and quality definitions. Investigate differences rather than attributing every change to supervision. Buyer mix, machine condition, operator tenure and material quality can all move the result. This caution does not weaken the case for localisation; it prevents a false success claim from concealing the remaining work.

The expatriate supervisor trap is thus avoidable without denying the original scarcity. Import a small number of experts to make difficult routines visible, require local deputies to perform them, and end the assignment when independent practice is stable. The factory then retains both the production standard and the people who can improve it. Its supervisory cost supports institutional memory instead of repeatedly purchasing the same command from abroad.

Buy the transfer of judgement, not a permanent lease on authority.

CHAPTER SOURCE NOTES

S06 International Labour Organization (ILO). 2019-08-26.

S11 Roskilde University Centre for African Economies (CAE). 2017.

S09 Open African Innovation Research (OpenAIR). 2021-02-17.

S13 SOAS University of London (IDCEA Project). 2018.

S10 Open African Innovation Research (OpenAIR). 2021-02-17.

R14 WageIndicator. Publication date unrecorded; inherited source-text check.

R15 wage.is. Publication date unrecorded; inherited source-text check.

S20 ILO and IFC Better Work. 2016-09.

S23 International Labour Organization (ILO). 2016-09-26.

S24 World Bank. 2012.

S27 American Economic Association (AEJ: Applied Economics). 2018-07.

S01 University of Warwick Department of Economics (RePEc). 2015.

S42 International Labour Organization (ILO). 2020.

S02 National University of Singapore Department of Economics (STITCH). 2021-10.

S03 National University of Singapore Department of Economics (STITCH). 2021-10.

S22 Better Work (ILO and IFC). 2018.

04

TECHNICAL ANATOMY OF THE SHOP-FLOOR LEADERSHIP LAYER / ANATOMY OF THE LINE SUPERVISOR

Line Supervisors Convert Static Industrial Engineering Into Dynamic Hourly Flow

A balance sheet allocates work. A supervisor keeps that allocation usable as attendance, materials, quality and machine condition change.

CHAPTER 04
DECISION TEST

A balance sheet allocates work. A supervisor keeps that allocation usable as attendance, materials, quality and machine condition change.

A sewing line needs a supervisor who can turn an approved engineering balance into safe, quality-accepted output throughout the shift. GFT recommends treating that role as an hourly control function: verify who and what is available, identify the current constraint, make an authorised adjustment, then check its effect on good output. The supervisor must also preserve the record of what changed. This chapter proposes a practical operating design for that function. It separates external research from illustrative factory arithmetic and from recommendations that a sponsor must test before adopting.

The case for developing this capability has experimental support, but no universal improvement factor. An Indian garment-firm randomised trial, reported in a preliminary October 2021 paper, found line productivity higher by 7.3 percent during supervisor training and 5.8 percent over the subsequent six-month observation period relative to control. Those are results for that intervention and setting, rather than a forecast for Cameroon. They justify testing supervisory practice; they do not establish the effect of any particular board, huddle or staffing ratio. [S02]

4.1

A supervisor's territory must permit observation and response

The engineering balance is the starting condition, not a description of every production minute. In the JP Garment study published by Hawassa University, the reported existing shirt line had 41 workstations and 67.6 percent line efficiency. The authors calculated alternatives using different balancing methods. Their operation analysis used a 33-second cycle time. These are case-specific engineering quantities, not a standard size or pace that every new garment line should adopt. [S31]

For an illustrative greenfield design, assume a line of 35 operators, an accountable supervisor and an assistant who can cover observation while the supervisor deals with an exception. The staffing basis is a proposed division of duties, not a measured industry norm. Test it against the actual walking route, visibility, language needs, assistance calls and complexity of the current style. A line with separated component preparation may require different coverage from a compact assembly cell, even when headcount is unchanged.

GFT recommends mapping the supervisor's territory by operation and material route. Mark the line entry, component joins, quality checks, repair holding area and accepted-output boundary. Check that the supervisor can reach the critical stations without blocking material movement or walking through unsafe spaces. A straight layout, a cellular arrangement and a hanger system should each be judged against that operating task. The layout cannot be accepted merely because its equipment count fits a floor plan.

This is consistent with the applied line-balancing discussion by Kong and colleagues: uneven upstream and downstream capacities create either accumulation or starvation, and changing layout alone does not resolve every capacity mismatch. Their paper discusses both batch and hanger arrangements. GFT uses that mechanism as a design warning, rather than adopting the paper's equipment preferences as a procurement recommendation. [S32]

Define the supervisor's authority at the same time as the territory. A proposed boundary permits an approved operator move, a controlled bundle split or a request for support. It reserves time-standard changes, unsafe equipment intervention and permanent method changes for the responsible technical roles. The assistant can collect counts and call attention to a queue. Delegation must still leave a clear decision owner and a visible record of who authorised the action.

The practical acceptance test is a disturbance rehearsal. Introduce a controlled material delay or a simulated station absence during training and observe whether the candidate finds the affected route, protects work identity and requests appropriate help. Assess the explanation as well as the speed of response. A supervisor who rapidly moves the wrong bundle has failed the test. A supervisor who recognises that recovery exceeds available competence should receive credit for escalating promptly.

Coverage should also survive breaks, meetings and absence of the supervisor. GFT recommends a handover card identifying the active constraint, work on hold and the person authorised to approve restart. Test the assistant's ability to use it without telephone instructions. The objective is continuity of control, rather than continuous physical presence by a particular individual. The territory is properly designed only when ordinary relief arrangements preserve that continuity.

4.2

Attendance must become a qualified station assignment before release

The opening attendance check should answer a production question: can the available team execute the authorised operation sequence? A headcount total cannot answer that question. GFT recommends linking the attendance record to a current skill matrix containing the operation, machine or attachment, observed quality, demonstrated pace, assessment date and assessor. An operator's competence on a familiar seam should not be treated as evidence of competence on every operation using the same machine.

In an illustrative opening condition, a 35-operator line has 2 absent operators, leaving 33 available. The missing share is 2 divided by 35, or approximately 5.7 percent. This is assumed arithmetic for a disturbance exercise, not an observed absenteeism rate in Cameroon. If an absence removes the only qualified person at a required joining operation, the throughput consequence can be much greater than the headcount percentage suggests.

The supervisor should first establish whether the apparent absence is real, temporary or a recording error. Next, identify the affected operation and its immediate dependencies. Consult the skill matrix for a qualified replacement and check the donor station before authorising a move. A transfer that opens an equally restrictive gap merely relocates the problem. Record the assignment and the expected effect so that the trial can be assessed against its own purpose.

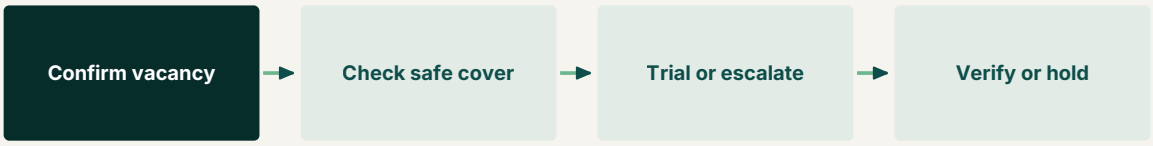
GFT proposes using demonstrated task competence as a constraint before ranking candidates by speed. Consider current quality acceptance, familiarity with fabric behaviour and safe machine use. Ask the operator whether the recorded competence

remains usable with the current attachment and construction. If confidence is uncertain, the supervisor should request a checked sample or technical confirmation. The matrix supports a conversation and a decision; it does not override the evidence at the workstation.

The illustrative decision sequence in **Exhibit 13**, p. 61 makes escalation an explicit outcome. It avoids a compulsory reassignment when no safe, qualified solution exists.

EXHIBIT 13 / PROPOSED DECISION SEQUENCE

A vacancy requires a qualified route before work is released



ILLUSTRATIVE Illustrative GFT operating design. Check task competence, quality and donor capacity. Without safe cover, escalate; if a trial fails, hold affected work and escalate. Sequence is not a productivity prediction.

The sequence cannot choose a replacement without local evidence. A manager must supply the authorised skill assessments and the rules for work release. Repeated vacancies at the same operation should trigger a training request, not a permanent dependence on emergency transfers. That learning belongs in workforce planning, while the supervisor remains accountable for explaining today's operating restriction.

GFT recommends preparing the attendance check within scheduled, compensated working arrangements. A proposed pre-start verification window is a planning choice, not a statement of legal entitlement or a request for unpaid preparation. The capacity plan must allow the huddle, handovers and required breaks explicitly. Otherwise the opening control process begins with an impossible target, and the supervisor is pressed to conceal its cost in the record.

4.3

The opening huddle must end with an owner and a test

A useful line huddle converts yesterday's exceptions into today's action. GFT proposes a short standing review at the visual board, supported by an accessible alternative for anyone who cannot comfortably stand. The supervisor should state the production objective, the quality condition and the principal constraint in plain language. Operators must be able to explain the instruction back, especially where technical vocabulary crosses languages.

An illustrative huddle allowance is 12 minutes, selected as a workable planning input rather than an observed optimum. In that allowance, review accepted output against the original plan, quality holds and the main interruption, then agree the action that matters most today. Do not turn the board into a complete plant dashboard. A short exception list allows the supervisor to ask whether a corrective action was actually verified rather than merely marked complete.

Bring an identified defect sample when it helps explain the required correction. The quality lead should distinguish the construction requirement from an operator preference and identify the authorised reference sample. The supervisor should ask what changed in the method, material or machine condition before assigning blame. Sensitive employment or health information belongs in the appropriate private process, not beside the public production figures.

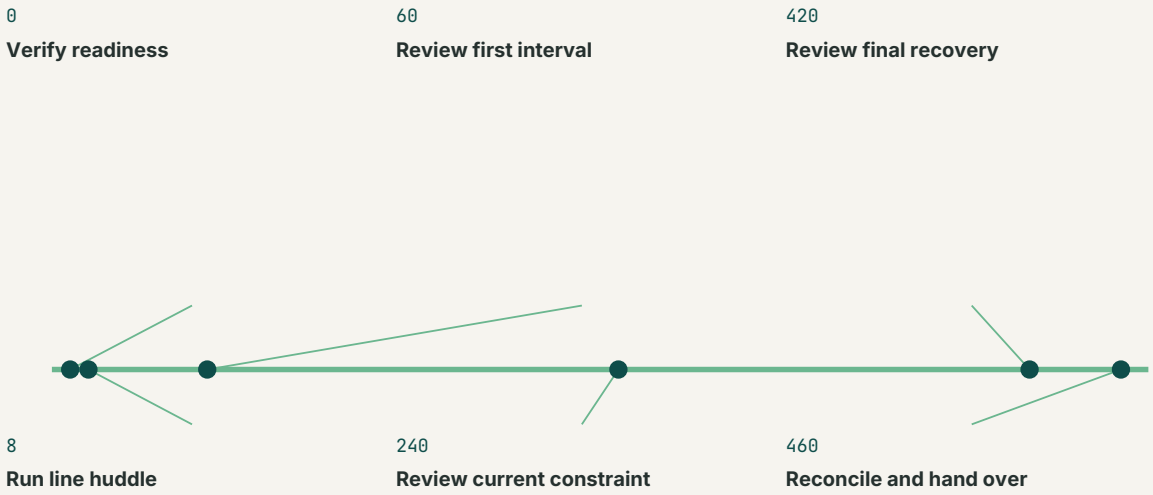
Better Work's supervisory training description includes listening, communication, time management and work allocation alongside responsibilities and worker rights. Its practical, interactive approach supports including these behaviours in supervisor preparation. It does not establish that a huddle of any specified duration creates a particular productivity gain. [S22]

Every action should specify an accountable role, the required evidence and the review point. For example, the supervisor can ask the mechanic to investigate repeated thread breaks and ask quality to confirm the restart sample. Writing only 'improve machine performance' leaves the completion test undefined. Writing only 'mechanic informed' records a notification, not restoration of acceptable operation. The supervisor should retain the distinction on the board and in the action log.

The proposed choreography in **Exhibit 14**, p. 63 shows how the huddle fits between readiness checks and end-of-shift reconciliation. Event positions illustrate the rhythm; they are not a legal working-time schedule or a complete time allocation.

EXHIBIT 14 / ILLUSTRATIVE ELAPSED MINUTES FROM SCHEDULED READINESS START

Opening checks and closure surround repeated hourly reviews



ILLUSTRATIVE Illustrative 480-minute duty window: readiness at 0, huddle at 8 for 12 minutes, first board review at 60, intermediate reviews at 120 through 420, reconciliation at 460. Breaks, paid time and net production require a separately approved schedule. Intermediate reviews are omitted for readability.

The timeline requires local scheduling before use. In particular, an hourly board interval containing a planned break needs an adjusted production opportunity, with the original schedule retained. It must not be compared uncritically with an uninterrupted interval. A recurring meeting should also have cover for an active machine or quality alert. The huddle helps organise response; it should never delay containment of a current hazard or defect cluster.

4.4

Hourly control must distinguish a queue from a genuine constraint

An hourly board is useful when the measurement boundary stays fixed. GFT recommends recording garments accepted at a named sewing-line exit, separately from pieces offered for inspection and garments awaiting repair. Show the interval target, interval accepted count, cumulative position and current cause of restriction. A bundle moved to the next table is not automatically a good garment. An accepted garment returning from repair is not newly produced a second time.

The supervisor's patrol should examine both upstream accumulation and downstream starvation. A queue can reflect a temporary batch release, a quality hold or an incorrect count rather than a slow operator. Observe its direction of change and speak to

the affected operator before transferring work. Where shade or size identity matters, preserve that identity through any split or diversion. Rebalancing should not create a traceability failure in pursuit of a better board total.

The JP Garment cycle-time input allows a useful rate calculation: 3,600 seconds per hour divided by 33 seconds gives approximately 109.1 station completions per uninterrupted hour. This is GFT arithmetic from the study's cycle time, not demonstrated good-garment output. It assumes sustained operation and omits breaks, losses and downstream quality restrictions. It should therefore be treated as an upper reference for the simplified example. [S31]

> **WORKED EXAMPLE: A SMALL CYCLE-TIME SLIP CREATES A MATERIAL QUEUE**
>
> In an illustrative serial-flow model, assume an upstream arrival interval of 33 seconds and a constrained downstream station taking 41 seconds per piece. These assumptions use the study's 33-second cycle time as a reference and add an assumed 8-second slip. Arrival capacity is 109.1 pieces per hour; service capacity is 87.8. The difference is approximately 21.3 pieces per hour. With continuous arrivals and enough upstream supply, the queue grows by about 7.1 pieces in 20 minutes. These fractional quantities describe rates, not fractional physical garments. [S31]
>
> For the same illustrative case, assume the next station consumes at 109.1 pieces per hour and starts with a buffer of 6 usable pieces. The net depletion rate is approximately 21.3 pieces per hour, so buffer exhaustion takes 6 divided by 21.3 hours, or about 16.9 minutes. This is a deterministic simplification. Real bundle movement, joins, rejection and stoppages can change the result. It demonstrates why the supervisor should inspect buffers before a shift-end total reveals the problem. [S31]

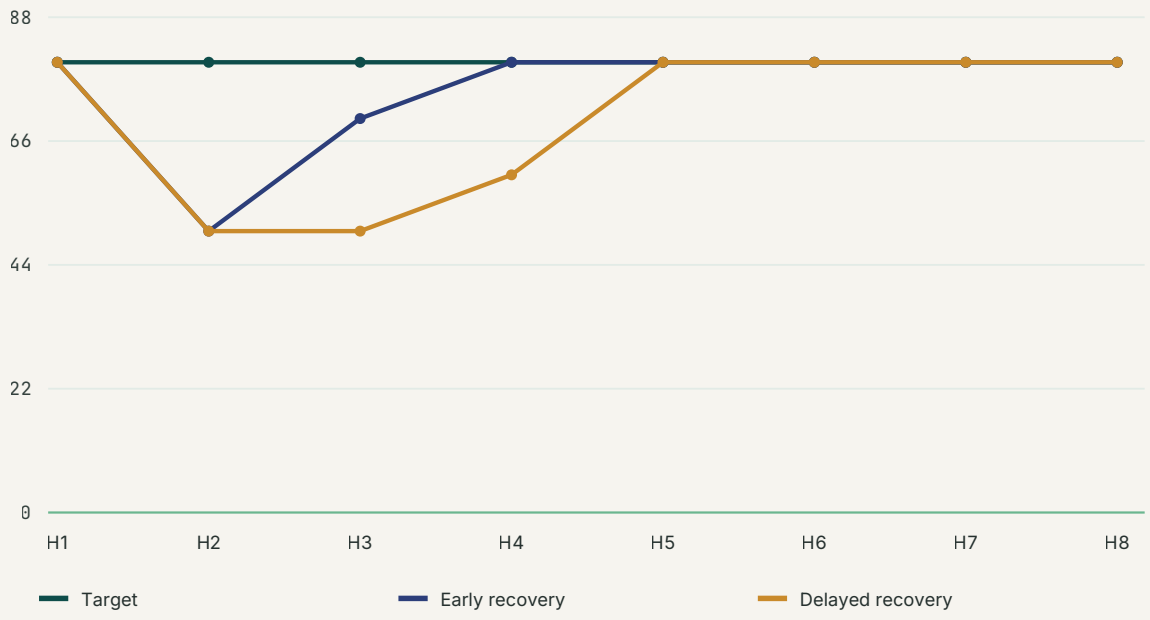
The response should address the cause. Material handling may justify a helper; a machine fault requires technical support; an unfamiliar operation requires checked coaching. Splitting work is appropriate only if the operation can be divided without breaching precedence or quality requirements. The supervisor should record the intervention time and compare good output afterwards. If the restriction moves, follow it; if the action worsens quality or safety, stop the trial and restore the approved arrangement.

Do not prescribe a universal limit in bundles. An illustrative limit of 2 bundles means 20 pieces if a bundle contains 10, but 60 pieces if it contains 30. The same visual pile count can therefore permit very different exposure. GFT recommends defining buffers in pieces, identity and approximate coverage time, then testing the limit against variability and handling requirements. A buffer warning is a prompt to investigate, not proof that an operator has failed.

The trajectories in **Exhibit 15**, p. 65 illustrate the consequences of recovery timing. They are deliberately constructed decision cases, not treatment and control observations from the research.

EXHIBIT 15 / ACCEPTED GARMENTS PER ILLUSTRATIVE PRODUCTION HOUR

Earlier recovery reduces the illustrative cumulative shortfall



ILLUSTRATIVE Illustrative assumptions: 8 comparable production hours, target 80 each hour. Early recovery totals 600; delayed recovery totals 560; target totals 640. Intervention gains are assumed, with no causal attribution. These production hours exclude planned non-production time and are not the duty-window timeline.

In this illustrative construction, early recovery leaves a shortfall of 40 garments against the 640 target, while delayed recovery leaves 80. The difference is 40 garments, based entirely on the chosen hourly assumptions. Neither path exceeds the target after recovery, so the model does not quietly assume unlimited catch-up capacity. The planning lesson is to state what is recoverable, revise the forecast openly and escalate an unrecoverable delivery risk.

A recovery action should have a stopping rule before it starts. GFT recommends stating what would make the supervisor reverse a transfer, stop a split bundle or call engineering again. A deterioration in accepted quality, an unsafe reach or a new identity mismatch should override apparent speed gains. Where the observation interval is too short to distinguish improvement from ordinary fluctuation, retain the action as unverified. This prevents every upward movement on the board from becoming an unsupported success claim.

The supervisor should also distinguish an operating forecast from a target. The released target records the approved intention; the forecast states the output now judged achievable with the remaining time and constraints. Keep both visible rather than erasing the original plan when performance falls behind. The plant manager then receives a decision: release qualified support, accept the shortfall or change the downstream commitment through the authorised planning process. Asking the line simply to try harder supplies no additional capacity.

4.5

A style changeover must restart the learning record

The supervisor should prepare a changeover jointly with industrial engineering, quality, maintenance and material control. GFT recommends confirming the operation breakdown, approved sample, machine and attachment readiness, component identity, operator assignment and acceptance checkpoints before release. The supervisor verifies execution on the floor; the industrial-engineering technician retains ownership of the time-standard method. This chapter does not replace that technical calculation with an improvised hourly target.

A proposed preparation horizon of 48 hours is illustrative. It gives a planning team a visible window for missing attachments, sample clarification and reassignment, but it is not an empirically established lead time. A simple repeat style may need less preparation; an unfamiliar construction may need substantially more. Treat unresolved requirements as release conditions. Starting because the calendar says so transfers uncertainty into live production and makes the resulting loss harder to interpret.

GFT recommends a controlled first bundle. Confirm the critical operation sequence and acceptance evidence before increasing release. Record the actual time of style change, the old-style work remaining and the disposition of mixed work. Reconcile a station that finishes an old style while another starts the new one. Otherwise the hourly line count can combine different work content and falsely suggest that the new style has already reached its intended pace.

For an illustrative capacity calculation, assume an 18-standard-minute garment, 30 operators, 60 productive minutes and a planning efficiency of 70 percent. Planned output equals 30 multiplied by 60 multiplied by 0.70, divided by 18, or 70 garments per production hour. If the assumed new-style efficiency is instead 50 percent, the same calculation gives 50 garments. The difference is a planning sensitivity, not a measured learning curve or permission to raise individual effort expectations.

Coaching should use the approved method and quality reference. Ask the operator to demonstrate the uncertain step, identify whether the issue is positioning, handling or machine condition, and confirm the corrected sample. A supervisor should not change a standard minute value to make the board look favourable. If the method itself proves unsuitable, request an engineering review and retain the original version alongside the replacement and its effective time.

Do not promise that a line will reach maturity after a fixed count of shifts. GFT recommends plotting accepted output, repair burden and the unresolved constraint separately until a locally defined stability test is met. A rapid output increase accompanied by growing repair stock is not evidence that learning has completed. The training team should receive the repeated skill gap, while scheduling receives an explicitly conditional capacity forecast.

Use a changeover review to improve the next release, without allowing retrospective explanations to replace observations. GFT recommends comparing the restrictions expected before start with those actually encountered. An attachment that arrived late is a readiness failure; a method that proved difficult despite preparation is a different

learning problem. Give each its appropriate owner. Repeatedly calling both issues operator learning would send the training team a misleading diagnosis and leave the preparation process unchanged.

The handback after changeover should close the trial as a controlled event. Confirm that temporary machine settings are documented, superseded instructions have been removed and material left from the previous style is identified. Ask the next supervisor to demonstrate where the current approved method is recorded. A successful restart is incomplete if the following shift must reconstruct how the line was configured or which samples were accepted.

4.6

Professional communication must preserve the warning signal

A supervisor needs permission and training to hear bad news early. GFT recommends assessing how candidates respond when an operator reports a defect, asks for assistance or disputes a count. The desired response is to establish the facts, contain the risk and clarify the next action. Public humiliation or threats should never be treated as operating tools. They should trigger the appropriate management response, independently of whether the line met its output target.

The ILO's report on the Better Work review connects improved working conditions with business performance and reports a 22 percent productivity increase for lines overseen by trained female supervisors compared with those whose supervisors had not yet received the training. The reported comparison is specific to the evaluated programme. It does not isolate a causal effect for calm speech alone, or show that every supervisor training course will produce the same result. [S23]

A separate ILO account of the Brazilian SCORE pilot reports an average 15 percent productivity increase and a 12 percent reduction in rework rates among subcontracted sewing workshops, based on SENAI data. Its participating setting and combined intervention differ from Better Work. These findings should not be added together, applied to the same baseline or presented as a guaranteed Cameroon improvement package. [S21]

GFT proposes practising communication with disturbances taken from the training line. The candidate should describe the observed problem without labelling the person, show the required method and ask for an explanation back. A private concern should have a private reporting route. Translation or demonstration may be needed for a technical instruction. Completion is demonstrated by shared understanding and acceptable execution, rather than by an operator agreeing under pressure.

The supervisor also needs an escalation route for personal stress and conflicting instructions. If management demands output that the approved staffing and equipment cannot support, the record should show that constraint. Overtime, pay treatment and employment action require the authorised policy and current legal review; this chapter provides no legal advice. The operating recommendation is to preserve visibility of the restriction instead of passing an impossible instruction down the line.

Include respectful response in the same assessment as technical diagnosis. A candidate who correctly identifies a bottleneck but punishes the person who reported it has not demonstrated supervisory readiness. Equally, courteous conversation without containment is insufficient. The practical standard combines a clear instruction, protection of the person, an appropriate technical response and a check that the instruction worked. Assess these behaviours under routine production pressure, not only in a classroom role-play.

4.7

The supervisor must own a usable record rather than a favourable total

GFT recommends assigning the supervisor accountability for the line record while keeping quality acceptance, maintenance diagnosis and people records with their responsible roles. Ownership means confirming completeness and reconciliation, not personally typing every entry. An assistant may capture observations. The supervisor should verify the boundary, resolve discrepancies and sign off a record that another person can reproduce from the underlying events.

The proposed field relationships in **Exhibit 16**, p. 68 connect local observations with broader management questions. They are an illustrative operating specification. They do not imply that a line supervisor directly controls shipment performance, utility purchasing or every plant-level sustainability measure.

EXHIBIT 16 / PROPOSED FIELD AND DECISION RELATIONSHIPS

Line observations support management measures only at defined boundaries

Family	Local observation	Required companion
Production	Accepted exit count	Released interval plan
Quality	Hold and repair count	Inspection population
Delivery	Ready quantity and time	Order and dispatch record
Cost	Attended time	Approved cost allocation
People	Station assignment	Verified skill record
Sustainability	Good-output boundary	Aligned utility reading

ILLUSTRATIVE Illustrative GFT specification. Delivery, cost and sustainability require records outside the sewing line; accepted output alone cannot establish these outcomes.

A proposed line record should identify the shift, style version, operation or station where relevant, event time, capture time, quantity state, responsible role and any correction. Event time and capture time should remain distinct. Late entry is sometimes unavoidable, but presenting it as contemporaneous observation conceals uncertainty. A missing observation should remain marked missing until resolved. Replacing it with a zero fabricates a production or downtime claim.

KEEP QUANTITY STATES AND DENOMINATORS SEPARATE

GFT recommends reconciling opening work, new releases, accepted transfers, rejects and closing work within the same style and physical boundary. Treat quality-held and repair pieces as identified states within that stock, rather than adding them again as new input. Count a garment's final accepted transfer once. For first-pass yield, use the inspected population on its first attempt and record the acceptance rule. For defects per hundred units, count defects and inspected units separately because a garment can contain several defects.

For an illustrative reconciliation, opening work is 120 garments and new release is 500. Accepted transfers are 460, permanent rejects are 10 and closing work is 150. The equality is 120 plus 500 equals 460 plus 10 plus 150, or 620 on each side. If 20 of the closing garments await repair, they remain inside the 150. Adding those 20 again would break conservation. This is a teaching case with assumed counts, not a GFT production result.

Downtime requires similar care. Record machine interruption separately from its effect on the whole line, and distinguish notification, response and verified restart. Overlapping mechanical and material events cannot simply be summed as lost line minutes. If the active cause is uncertain, keep the uncertainty visible and ask the responsible technical role to validate it. A neatly coded but unsupported cause can train management to fix the wrong problem.

GFT NOTE

Make record quality part of supervisor qualification. Ask the candidate to explain a count discrepancy, trace a repaired garment without double counting, preserve the original plan and document an unsuccessful intervention. Reward early, accurate exception reporting. A clean-looking board that conceals a restriction is worse evidence than a complete record showing that the line missed its target.

The Indian training study offers an important qualification: its authors did not find evidence of worker attendance or retention effects in their analysis and cautioned about noisy worker-to-line matches. A sponsor should therefore measure those outcomes directly rather than assume they improve automatically when productivity rises. The same study's retention findings for supervisors are a different outcome and population. [S02]

The record must remain light enough to maintain while running the line. GFT recommends an exception-based design: capture routine counts in a consistent place and add event detail where a decision or restriction changes. Avoid asking the supervisor to narrate an entire shift in free text. Trial the form during disturbance exercises and observe whether recording displaces assistance at a critical station. If it does, simplify the fields or delegate observation while preserving verification and ownership.

Review record quality without turning every discrepancy into misconduct. GFT recommends distinguishing a corrected counting mistake, an unresolved difference and deliberate alteration of the history. Preserve the original entry and the reason for correction so that the reviewer can see the distinction. A system that penalises all

corrections equally gives staff a reason to hide uncertainty. The useful management question is whether the record supports a sound decision and whether recurring errors receive a practical remedy.

Before the record feeds a digital system, preserve its definitions, event identity and revision history. GFT recommends retaining the distinction between a proposed assignment, an executed move and a verified recovery. A future optimisation model should not learn that every recorded recommendation was implemented successfully. Nor should it infer worker competence from an output count whose quality status is unknown. The manual record is useful precisely when it retains those operational distinctions.

Qualification should finish with an observed shift and a handover challenge. Ask a different competent person to reconstruct the day's original target, constraint, intervention, accepted output and unresolved work from the record. If reconstruction requires the supervisor's memory, improve the capture method before expanding the responsibility. The readiness criterion is a line whose decisions remain intelligible when its supervisor leaves the floor.

A balanced line becomes a working system when its supervisor can see, act and leave evidence.

CHAPTER SOURCE NOTES

S02 National University of Singapore Department of Economics (STITCH). 2021-10-06.

S31 Hawassa University (Ethiopian Journal of Engineering and Technology). 2023.

S32 arXiv / City University of Hong Kong. 2025-02-14.

S22 Better Work (ILO and IFC). 2016-09-26.

S23 International Labour Organization (ILO). 2016-10-06.

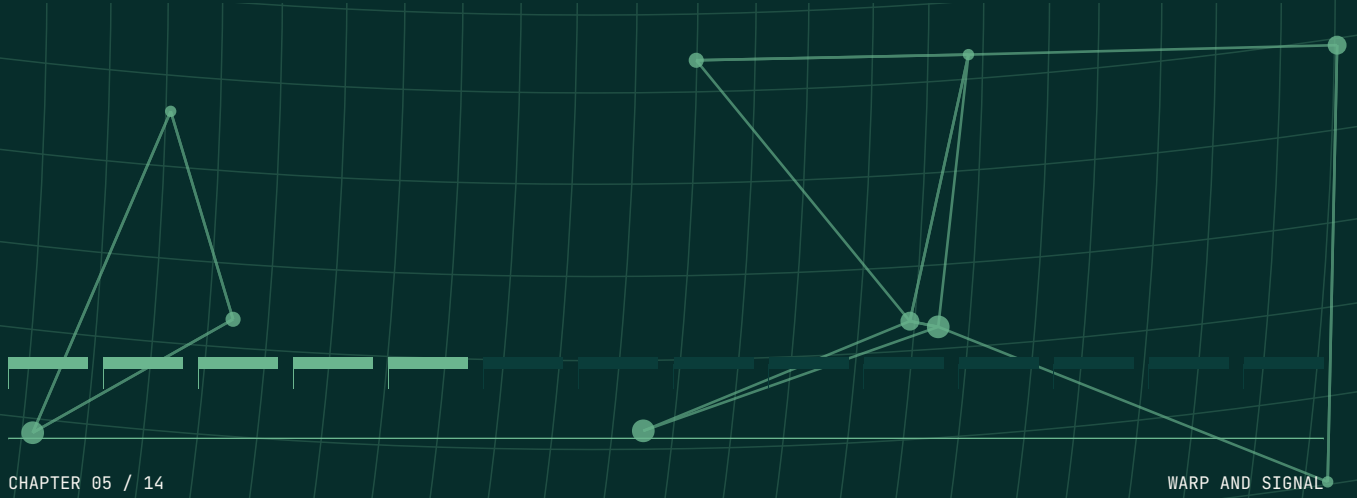
S21 International Labour Organization (ILO). 2024-12-05.

05

TECHNICAL ANATOMY OF THE SHOP-FLOOR LEADERSHIP LAYER / THE WORK-STUDY AND IE PIPELINE

Industrial Engineering Technicians Govern Standard Minutes and Line Balance

A fair production target needs a documented method, a defensible time standard and a line assignment that survives contact with the actual workforce.



CHAPTER 05
DECISION TEST

A fair production target needs a documented method, a defensible time standard and a line assignment that survives contact with the actual workforce.

A greenfield garment factory should qualify its industrial-engineering technicians before allowing standard minutes to govern production commitments or operator assessment. Their task is to establish the work content, preserve its assumptions, allocate it to feasible stations and test the resulting capacity. GFT recommends treating the standard as a controlled engineering record, rather than a bargaining number. The chapter sets out that proposed control system and an illustrative training route. It does not describe an operating GFT factory or a completed technician cohort.

5.1

Unmeasured work content makes apparently precise targets unreliable

Cameroon's inherited cotton baseline records about 95 percent of fibre exported raw and about 5 percent processed locally. The original publication date was not recorded, so these figures are context rather than a freshly verified production measure. Moving further into processing requires a factory-level account of labour content; the national baseline cannot supply the minutes needed to sew a particular product. [R06]

The ILO's Ethiopian garment-sector assessment identifies shortages in production management, planning and engineering. This is evidence about the factories and institutions examined in Ethiopia, not a survey of Cameroonian technicians. It supports investigating local capability before launch, rather than assuming that a technical qualification already establishes competence in garment work study. [S06]

GFT proposes a practical distinction between an estimate for commercial screening and a released production standard. A screening estimate may help compare product families, provided its uncertainty remains visible. A released standard should identify the garment specification, accepted sewing method, equipment, material, measurement basis and approver. Moving a number between those categories should require evidence. Merely copying it into a production spreadsheet should confer no additional authority.

A useful diagnostic is to ask whether another technician could reproduce the standard from its record. If the answer depends on remembering which operator was observed or which folder was fitted, the record is incomplete. If nobody can explain whether bundle handling was included, the apparent disagreement between actual time and standard time cannot yet be called poor performance. The first intervention should be to repair the measurement boundary.

For procurement and staffing decisions, GFT recommends keeping engineering confidence alongside each operation. A provisional method deserves a provisional capacity allowance. An approved method with little observation deserves a validation task. A repeated, stable method can support firmer planning, subject to material and equipment compatibility. This approach directs scarce technician attention towards uncertainty that affects delivery, rather than towards whichever spreadsheet cell contains the largest apparent efficiency loss.

The proposed division of responsibility is deliberate. The technician owns the analytical baseline and controlled method revisions. The supervisor owns current staffing and the shift's operating response. Quality personnel confirm the acceptance criteria. Maintenance personnel confirm that the machine can perform the approved method safely. The production manager authorises the resulting plan. These are recommended accountabilities, not claims about current GFT staffing or systems.

The technician should therefore be recruited as an investigator and communicator as well as a calculator. A candidate who can explain why a trial failed may be more useful than a candidate who produces an immaculate balance chart from unchecked inputs. The intended output is an inspectable production promise: the factory knows what it assumed, what it measured and what would make the promise invalid.

5.2

An operation breakdown must connect method, time and acceptable quality

GFT recommends starting with a physical pre-production sample and a construction specification. The operation breakdown should name each transformation, its predecessors, machine family, attachment and acceptance condition. Separate sewing from inspection or handling wherever that separation changes resource requirements. Record whether the operation applies to each garment, each component or each bundle. Otherwise, component counts and batch activities can quietly distort the garment total.

A primary shirt-manufacturing study describes using time-study checks, video analysis and process diagrams to examine working methods. Its sequence is useful evidence for analysing a method before accepting its duration. It does not establish a transferable standard minute value for a Cameroonian uniform, nor an automatic improvement entitlement for another factory. [S0501]

In the proposed observation protocol, the technician first explains the exercise to the operator and confirms that the method is safe and understood. Record representative cycles with their material and equipment conditions. Preserve interruptions as classified observations, rather than deleting inconvenient readings without explanation. Distinguish normal handling from a power interruption or a damaged component. Those events require different corrective decisions even when their elapsed durations happen to match.

The observation sheet should retain the raw readings, selected cycles, rejection reasons and rating basis. Operator pace rating should be reviewed separately from the stopwatch readings because it is a judgement. GFT recommends calibration exercises in which trainees rate the same recorded task, explain differences and reconcile their interpretation with a qualified assessor. Agreement on a rating does not prove the method is appropriate; both questions require review.

METHOD

For the proposed calculation convention, basic time equals representative observed time multiplied by the pace-rating factor. Standard allowed time then equals basic time multiplied by one plus the allowance expressed as a fraction of basic time. If allowances are instead defined as a fraction of standard time, divide basic time by one minus that allowance. State the convention on every approved sheet. The worked values below are illustrative assumptions, not prescribed allowance rates.

In an illustrative calculation, an observed operation takes 30 seconds, its agreed rating factor is 0.90 and its allowance is 15 percent of basic time. Basic time is 30 × 0.90 = 27 seconds. Standard time is 27 × 1.15 = 31.05 seconds, or 0.5175 minutes per operation. If the same nominal 15 percent were defined against standard time, the result would instead be 27 ÷ 0.85 = 31.76 seconds after rounding. The difference comes from the denominator, not the operator.

GFT recommends documenting allowances for personal needs, fatigue and defined minor delays without claiming that a single generic percentage suits all tasks. Identify scheduled breaks separately and check that they have not also been subtracted from the production window inconsistently. Extended outages should remain visible in availability records. Building them into standard sewing time would make machine unreliability look like product work content and obscure the decision to repair it.

A predetermined motion-time estimate can serve as a cross-check where the factory has the relevant method, competent users and any required rights. It should not replace local verification of fabric handling, attachment setup or acceptance quality. GFT's proposed standard register should identify whether a value came from direct observation, an authorised predetermined system, an analogous operation or an unresolved estimate. Do not mix those origins silently when summing garment minutes.

For the release gate, require a method illustration, observation record, allowance convention, quality sample and revision signature. Preserve the superseded value and its effective period. A changed fabric, seam construction or machine setup should trigger a compatibility review. A difficult shift alone should trigger investigation. Rewriting the standard whenever performance falls would erase the evidence needed to distinguish learning, breakdown and a genuinely unsuitable method.

5.3 A RELEASE DECISION NEEDS AN OBSERVATION PLAN RATHER THAN A LONE AVERAGE

The observation plan should state its purpose before the stopwatch starts. A study intended to release a stable method differs from a diagnostic study of a learning operator or an investigation of intermittent faults. GFT recommends recording operator experience, material lot, machine, attachment, shift conditions and product revision as stratification fields. The technician can then test whether observations belong to the same engineering condition. Selecting only the fastest available operator would answer a different question from estimating the method's expected work content across the intended workforce.

No universal cycle count can rescue a poorly defined sample. The technician should predetermine inclusion rules, observe enough cycles to examine stability and explain why further readings would not materially change the release decision. Retain the sequence of readings so drift, learning and interruptions remain visible. Report the spread alongside the representative time. An unusually short cycle is not automatically the best estimate, and an unusually long cycle is not automatically an error. Each exclusion needs a cause code and a reviewer.

In an illustrative observation set, six cycles of 28, 29, 30, 30, 31 and 32 seconds total 180 seconds and average 30 seconds. Choosing the minimum instead would remove 2 seconds, or about 6.7 percent of the observed average, without any demonstrated method improvement. The observed range of 4 seconds describes this small teaching sample only. It is neither a confidence interval nor proof of the underlying distribution. The example shows why the selection rule belongs in the released record.

A second technician should be able to repeat at least part of the study from the documented setup. Review disagreement by checking the operation boundary, timing points, rating interpretation and allowance convention before debating the result. Where replication fails, keep the standard provisional and identify the missing control. This is slower than accepting a single precise average, but it prevents false precision from travelling into staffing, delivery promises and operator assessment.

5.4

Demand pace and station capacity must use compatible boundaries

GFT proposes reserving separate names for separate calculations. Demand takt is net production time divided by required good output. Average work content per assigned operator is garment standard minutes divided by the direct operator count. A station's actual cycle is an observed elapsed duration under stated conditions. The longest effective station cycle constrains a simple serial line, while parallel resources and shared workers require their own capacity calculation.

In an illustrative planning case, a net production window of 420 minutes and a requirement for 700 acceptable garments give demand takt of 0.60 minutes, or 36 seconds, per garment. An assumed garment content of 18 standard minutes and 35 direct operators gives average content per operator of 18 ÷ 35 = 0.5143 minutes, or about 30.86 seconds. The average sits below demand takt, but that alone cannot show that every station can meet it.

WORKED EXAMPLE: THE BOTTLENECK DEFEATS THE AVERAGE

Use the illustrative assumptions above and suppose an indivisible operation requires 45 seconds of repeatable elapsed time on its assigned machine. Its ideal ceiling is 3,600 ÷ 45 = 80 garments an hour. Meeting 700 garments within 7 net hours requires 100 an hour, so that station cannot meet demand even though the line's average work content appears adequate. These are ideal ceilings without variability, loss or rework.

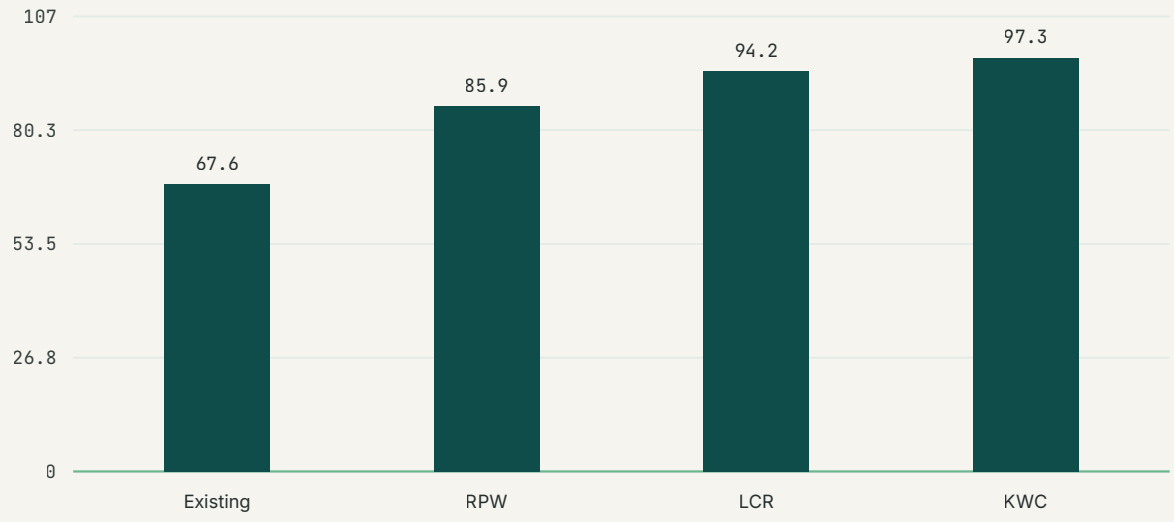
If a validated attachment reduces that illustrative elapsed cycle to 35 seconds, the station ceiling becomes about 102.86 garments an hour. This only removes the identified capacity conflict. The technician must still test the next constraint, accepted quality, replenishment and break cover. If the attachment is unsuitable, a parallel station may be investigated, but it requires a qualified operator, compatible machine and workable material routing. A spreadsheet cannot supply those resources.

The planning sheet should show net time, staffing boundary, good-output requirement and product standard on the same view. GFT recommends reporting earned standard minutes from accepted output separately from the modelled balance ratio. The former relates observed production to labour input. The latter describes how a task allocation fills a chosen cycle envelope. Giving them different names prevents an elegant allocation from being mistaken for demonstrated labour productivity.

The Hawassa line-balancing paper supplies the reported comparison in **Exhibit 17**, p. 76. Its proposed methods improve the calculated balance measures against the existing configuration. These values should be read as case-study results, not performance guarantees for another factory. [S31]

EXHIBIT 17 / REPORTED LINE EFFICIENCY, PERCENT

The Hawassa study reports higher balance measures for proposed allocations



SOURCED [S31] Table 8 compares existing and proposed configurations: 41, 34, 31 and 30 workstations respectively. Proposed balance results are not a Cameroon operating forecast.

The paper also switches operator and workstation counts between some balance and output calculations. GFT therefore recommends retaining its comparative balance evidence while withholding a transferred shirts-per-shift promise. A local release should reconcile work content, active resources and production time before any output figure enters an order commitment. [S31]

For mixed products, GFT recommends retaining a product-specific standard instead of dividing all output by an average garment that nobody actually makes. For partial shifts, separate time assigned to each product and record changeover time explicitly. For rework, keep the original completion count and the repair workload distinct. These choices make the model harder to game and give the technician a cleaner basis for explaining capacity differences.

5.5

Heuristics generate feasible candidates rather than prove a deployable optimum

The proposed balancing workflow starts by checking the precedence graph for missing links, duplicate operations and cycles. Every required task must appear exactly once in the allocation unless an explicitly defined parallel-resource rule says otherwise. Confirm the machine and skill constraints before comparing mathematical scores. A workstation that combines incompatible equipment or inaccessible subassemblies is infeasible even when its summed duration fits below the chosen cycle ceiling.

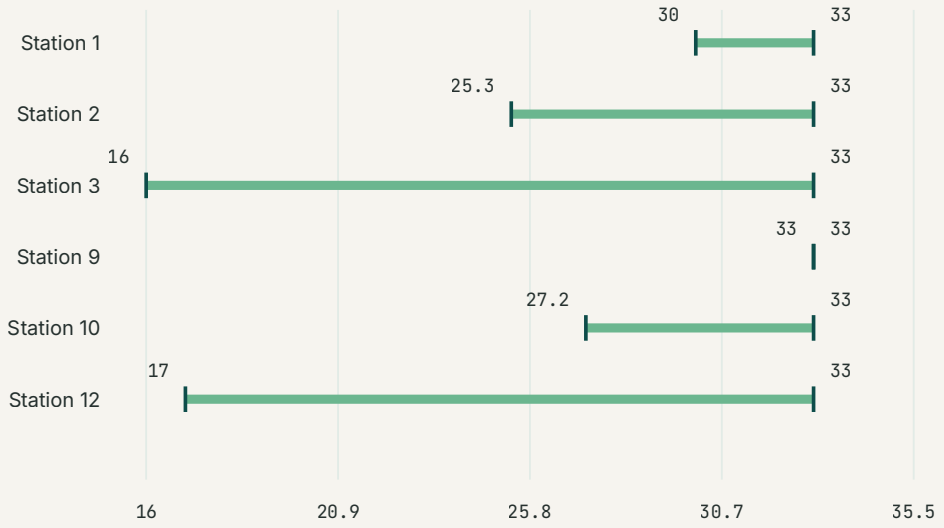
For the proposed spreadsheet, Ranked Positional Weight prioritises each task by its duration plus unique downstream task durations. The Largest Candidate Rule considers eligible tasks in descending task duration. Kilbridge and Wester organises tasks by precedence columns. Each candidate must still respect precedence and resource compatibility; shared successors should not be counted repeatedly when computing positional weights. [S31]

GFT recommends running the candidate methods against the same controlled input set. Use a stated tie-break rule so that another technician can reproduce the result. Record unassigned tasks and the reason they could not fit. A solver that quietly drops an awkward task has failed, regardless of the efficiency it displays. Compare feasible alternatives on staffing, movement, machine requirements, recovery capacity and quality risk as well as on arithmetic occupancy.

Selected allocations in **Exhibit 18**, p. 78 show how a common cycle envelope can contain very different station headroom. This is a transcription of chosen rows, not a reconstruction of an entire local shirt line. The intervals run from allocated work to the design ceiling and do not represent statistical uncertainty. [S31]

EXHIBIT 18 / SECONDS PER CYCLE

Selected RPW stations retain different amounts of cycle headroom



SOURCED [S31] Selected Table 5 RPW station loads versus the paper's 33-second ceiling. Each interval is unused headroom, not measured variability or a before-and-after pair.

Do not interpret every gap as an instruction to add work. GFT recommends checking whether the apparent spare capacity is usable given movement, replenishment, task dependency and worker competence. An aggregate surplus can coexist with an isolated constraint. Conversely, removing all visible headroom can leave a candidate unable to recover from ordinary variation. The appropriate buffer should be justified through trials at the intended operating boundary, rather than copied from another product.

The technician's trial record should compare predicted and observed completion at each candidate constraint, rejected work and material queues. Observe whether the operator can maintain the approved method after the initial trial enthusiasm fades. Invite the operator to identify awkward reaches or handling steps that the chart omits. Where the allocation needs frequent supervisory rescue, retain the observation as evidence against release instead of treating rescue as invisible capacity.

Before proposing a reduced station count, identify what happens to the work and the affected resources. Released capacity may support training, absence cover or another product. It is not automatically a cash saving, and a theoretical headcount reduction should not enter the financial case without an executable staffing plan. The preferred balance is the one the factory can sustain safely with accepted output and an honest record of its assumptions.

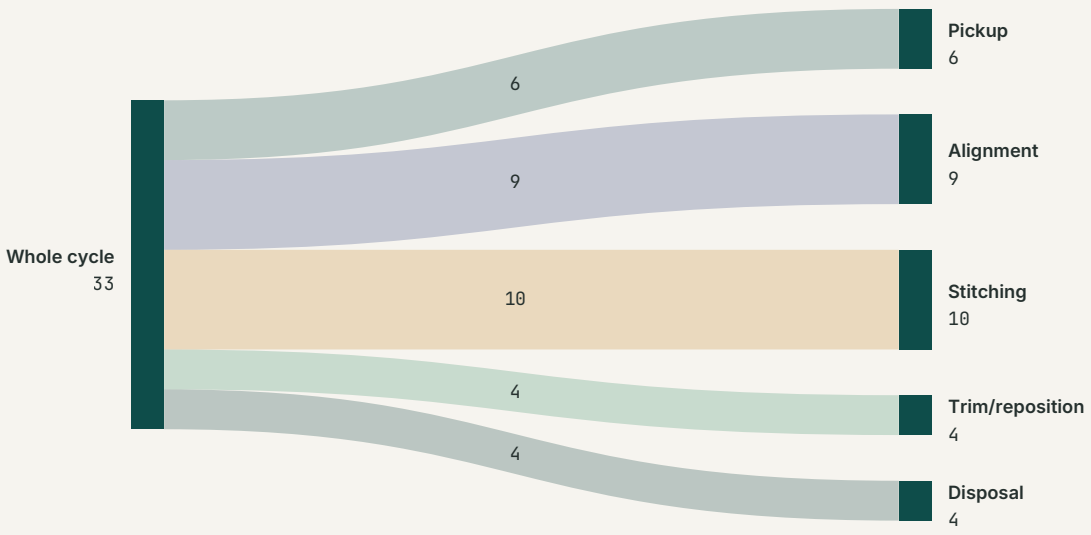
5.6

Method engineering should reduce handling while preserving safe work

GFT recommends analysing the sequence within a constrained operation before assuming that faster needle motion is the answer. Break the method into pickup, alignment, sewing, trimming and disposal where those elements are useful. The illustrative decomposition in **Exhibit 19**, p. 79 provides a teaching case. Its durations are assumed and do not establish a typical handling share for the industry or any GFT production line.

EXHIBIT 19 / ILLUSTRATIVE SECONDS PER OPERATION

The illustrative cycle exposes handling as a separate improvement question



ILLUSTRATIVE Assumed teaching cycle: 6 pickup + 9 alignment + 10 stitching + 4 trim/reposition + 4 disposal = 33 seconds. No observed factory data or automatic savings are implied.

For this illustrative cycle, handling outside stitching totals 23 seconds, or 23 ÷ 33 = 69.7 percent after rounding. That arithmetic creates a question for observation, not permission to delete the time. Alignment may protect seam accuracy, trimming may prevent contamination and disposal may preserve component orientation. The technician should first ask which motions are avoidable under the specified quality requirement.

GFT proposes a controlled attachment trial: describe the current method, confirm machine compatibility, test the guide or folder, compare accepted seams and observe operator posture. Include setup and cleaning effort in the decision where those activities change. A fixture that saves apparent cycle time but damages an exposed edge or obstructs safe access should fail the release gate. Keep maintenance responsible for any equipment changes within its competence boundary.

The ILO sector code recommends assessing workstation and work-organisation risks, including force, repetition, posture and environmental conditions. It prefers engineering controls that remove ergonomic hazards at their source. These are reasons to examine the whole task when changing a method, rather than treating speed as the sole acceptance measure. [S40]

For the proposed station review, ask whether the operator can retrieve components without twisting, see the stitch area clearly and use the pedal without an awkward seated position. Trial the arrangement with the people expected to use it. Record adjustment needs and escalate unresolved hazards. This review is an engineering recommendation informed by the ILO code, not a statement that any particular arrangement meets local legal requirements or constitutes a certified assessment. [S40]

In the illustrative cycle, reducing alignment by 2 seconds while retaining acceptance quality would change the total from 33 to 31 seconds, a reduction of about 6.1 percent. The gross ideal cycle-capacity change would be 33 ÷ 31 minus 1, or about 6.5 percent. These are different measures. Neither is a forecast of line output because another station, material supply or availability may remain the binding constraint.

An approved improvement should create a new method revision with its supporting trial record. Retain the earlier standard so that management can distinguish an improved method from improved operator performance on the same method. That distinction matters when evaluating training or incentives. GFT recommends releasing the method, its safe setup and its quality condition together; releasing only the shorter number would discard the engineering work that made the change defensible.

5.7 STATION SAVINGS ENTER THE BUSINESS CASE ONLY AFTER LINE-LEVEL RECONCILIATION

A shorter station cycle does not automatically create more saleable garments. If that station already has spare capacity relative to the line constraint, the intervention may reduce handling effort or local queues without changing line throughput. The technician should therefore locate the affected station in the complete routing, identify the next constraint and reconcile accepted output. Claiming the station's percentage saving as a factory productivity gain would confuse local motion economy with system performance.

Consider an illustrative non-bottleneck station whose cycle falls from 30 to 28 seconds while the effective line constraint remains 35 seconds. The ideal constraint ceiling stays at 3,600 ÷ 35 = 102.86 garments an hour. The 2-second station saving may still be worthwhile for ergonomics, quality or recovery time, but this model gives it no gross throughput benefit. That distinction should be explicit when the improvement proposal is approved.

If the validated intervention instead reduces the binding constraint from 35 to 33 seconds, the same ideal model moves from 102.86 to 109.09 garments an hour. The difference is about 6.23 garments an hour, or 6.1 percent relative to the former ceiling. This remains an illustrative upper bound. Realised benefit depends on the next constraint, staffing, material supply, machine availability and accepted quality. The trial should measure those conditions rather than assume them away.

Financial evaluation should use the accepted units or paid hours that actually change. A released operator hour becomes a cash saving only if staffing or paid time changes; otherwise it is capacity available for another documented use. GFT recommends separating measured station savings, modelled line effects and realised financial effects in the improvement register. This prevents an approved attachment trial from becoming an unsupported margin claim and directs management towards the remaining system constraint.

5.8

The supervisor needs capacity-adjusted assignments and a stable revision trail

The modern-garment line-balancing preprint examines balancing alongside intelligent hanger systems and digitalisation. It argues that transport technology without balancing does not itself improve output rates. Its setting supports checking the production logic beneath a digital interface, rather than treating a tracking or transport installation as proof of a feasible balance. [S32]

For GFT's proposed operating model, the technician should supply a signed baseline and a capacity-adjusted assignment for the people actually available. Use operation-specific evidence from the skill matrix, with an observation date and acceptance-quality condition. A generic label such as experienced should not substitute for demonstrated competence on a particular machine and method. Keep provisional assignments visible so that the supervisor knows where additional support may be needed.

In an illustrative assignment, an operation has a standard of 0.50 minutes and the assigned operator's validated task-specific attainment is 80 percent. The planning approximation is 0.50 ÷ 0.80 = 0.625 elapsed minutes, or 37.5 seconds, per operation. This estimate assumes comparable conditions and stable attainment. It should not be read as a permanent attribute of the worker or used to normalise unsafe pressure.

A second illustrative operator at 95 percent attainment would imply 0.50 ÷ 0.95 = about 0.5263 minutes, or 31.58 seconds. Moving that person might relieve the station, but the technician must calculate the capacity lost at the person's previous assignment. GFT recommends evaluating the whole reassignment chain and the quality implications. Moving the visible queue without tracing its cause can merely move the constraint elsewhere.

During a disruption, the supervisor should select from approved responses and record the actual assignment and effective period. The technician should investigate changes that alter work content, resource logic or the method itself. A temporary parallel task, shared floater or reordered independent subassembly needs an explicit routing and acceptance check. Where the proposed response exceeds the approved method, use a controlled trial rather than a silent standard revision.

The proposed record should distinguish the product standard, operator-task capability evidence, machine availability and shift outcome. These describe different things. Combining them in a single mutable efficiency percentage would make later analysis

ambiguous. A production system should be able to explain whether a shortfall arose from the original standard, the selected assignment or an interruption. That is the practical measurement thread connecting engineering to supervision.

GFT recommends retaining paper or controlled spreadsheet records where needed, with the same identifiers later used in a digital tool. Product revision, operation code, method version and effective time should travel together. Any Line-Balancing Studio implementation should be tested against the hand calculation before its recommendation governs a shift. This chapter specifies an intended data contract; it does not certify the availability or correctness of a particular software build.

At handover, the technician should identify the predicted constraint, vulnerable assignments, approved substitutions and conditions requiring escalation. The supervisor should return observed completion, queues, quality exceptions and disruption records. This closes the engineering feedback loop without making the technician the owner of every hourly operating decision. It also gives the next method review evidence that survives changes in personnel and recollection.

5.9

Local technician qualification must depend on demonstrated work

GFT recommends recruiting in Cameroon through a practical assessment open to relevant technical graduates and experienced production candidates. Test unit conversion, elementary arithmetic, spreadsheet reasoning, construction awareness and clear explanation. A diploma may be useful evidence of preparation, but the proposed process should not treat its title as proof of garment-specific capability. Institutional partnership and credential recognition require separate verification before any recruitment promise is made.

The illustrative programme in **Exhibit 20**, p. 83 allocates twelve weeks to successive work products. Its duration is a planning assumption, not a finding that every trainee can qualify within that period. The proposed assessment should permit additional supervised practice or a narrower initial authority where evidence is incomplete. Graduation should depend on defensible decisions and a reproducible record, rather than attendance alone.

EXHIBIT 20 / ILLUSTRATIVE TRAINING WEEKS AND RELEASE EVIDENCE

The illustrative boot camp qualifies successive engineering work products

Weeks	Practice	Assessment evidence
1 to 2	Construction and routing	Complete operation breakdown
3 to 4	Observation and rating	Reproducible time-study record
5 to 6	Allowances and cross-checks	Defended standard calculation
7 to 8	Precedence and heuristics	Feasible, audited allocation
9 to 10	Methods and ergonomics	Reviewed station trial
11 to 12	Live planning and records	Witnessed release and handover

ILLUSTRATIVE Proposed six-module, twelve-week route. Duration and sequencing are planning assumptions. No existing GFT cohort, institutional agreement or qualification outcome is claimed.

The assessor should introduce deliberate errors: a component counted as a garment, a missing predecessor, an incompatible machine allocation and an allowance denominator changed without explanation. Ask the candidate to diagnose the consequences and correct the record. Include a disputed observation in which the operator offers a plausible alternative explanation. The ability to preserve evidence and revise a conclusion is part of engineering competence, not a distraction from it.

GFT's proposed release sequence appears in **Exhibit 21**, p. 84. It separates a trial from authority to issue standards. Passing a spreadsheet exercise should not authorise unsupervised changes to production methods. Conversely, a candidate who can perform observations well may contribute under supervision while developing the judgement needed to approve a complete balance.

EXHIBIT 21 / ILLUSTRATIVE QUALIFICATION DECISIONS

The proposed release requires witnessed evidence and continuing review



3. Evidence incomplete
4. Evidence accepted
6. Capability gap

ILLUSTRATIVE GFT proposal: assess the work product, return deficient evidence for coached practice, and release only after witnessed verification. This is not an operating certification scheme.

For capacity planning, GFT recommends sizing technician coverage from the workload of style introductions, method investigations, standard reviews and coaching. Begin with the expected task queue and include travel between lines, assessment time and absence cover. Treat any proposed cohort size or lines-per-technician ratio as an estimate until a pilot establishes the service load. This prevents an attractive staffing ratio from concealing an unmanageable backlog of provisional standards.

> **GFT NOTE**
>
> Before releasing a production commitment, require a traceable operation breakdown, an agreed allowance convention, a feasible resource assignment, an accepted-quality trial and a named approval boundary. Protect the operator's route to challenge a disputed standard. Expand technician authority only when the assessment evidence supports it. The proposed training duration is a budget input; demonstrated capability is the release condition.

The final acceptance question should be practical: can the technician explain the promised output, reproduce the arithmetic, identify what could invalidate it and respond fairly when the floor disagrees? If that answer remains uncertain, continue supervised production learning and retain conditional commitments. A controlled

standard gives the supervisor something useful to manage and gives management a reasoned basis for capacity decisions. That is the contribution the technician pipeline should be funded to deliver.

A standard minute earns authority when its method can be reproduced.

CHAPTER SOURCE NOTES

R06 Cameroon Trade Hub. Publication date unrecorded; inherited source-text check.

S06 International Labour Organization (ILO). 2019-08-26.

S0501 Hawassa University, Ethiopian Journal of Engineering and Technology. 2024-06-20.

S31 Hawassa University (Ethiopian Journal of Engineering and Technology). 2023-10-20.

S40 International Labour Organization (ILO). 2022.

S32 Authors via arXiv. 2025-02-14.

GREEN FUTURE TECH
LIMITED / HONG KONG SAR

06

Sewing Machine Mechanics Protect Availability Against Spare-Part Import Exposure

When a looper jams or a needle bar loses timing on a paced sewing line, every minute of mechanic delay multiplies into idle operator payroll and missed shipments, while poor maintenance exposes the plant to euro-pegged imported spare-part costs.

CHAPTER 06
DECISION TEST

When a looper jams or a needle bar loses timing on a paced sewing line, every minute of mechanic delay multiplies into idle operator payroll and missed shipments, while poor maintenance exposes the plant to euro-pegged imported spare-part costs.

A greenfield garment factory cannot convert low nominal wages into competitive unit costs if its sewing machines sit waiting for a wrench or an imported spare part. [S0601] Even when industrial engineers balance a progressive bundle line above 85 percent theoretical efficiency and line supervisors run disciplined morning huddles, throughput collapses whenever mechanical breakdowns or electrical transients halt critical workstations. [S31] In Green Future Tech's three-part Cameroon textile programme (feasibility study, performance-management system design and digital strategy, prepared 31 January 2024 with 2026 source refreshes), machine maintenance is engineered as a frontline availability shield rather than a back-room repair shop. [R12] By training twelve local Cameroonian sewing-machine mechanics in Total Productive Maintenance (TPM), sub-millimetre kinematic calibration, direct-drive servo protection and two-bin spare-parts Kanban governance, an illustrative 900-person, 750-machine cut-make-trim plant holds Mean Time to Repair (MTTR) below 18 minutes, lifts Overall Equipment Effectiveness (OEE) above 78 percent, and insulates cash flow against foreign-exchange and customs delays on imported parts. [R32] [S38] [S39]

6.1

Machine availability is the silent killer of African textile and garment lines

Overall Equipment Effectiveness (OEE), the anchor metric of the Production family in GFT's Performance-Management System (Deliverable 2, Section 3), is the multiplicative product of machine Availability, speed Performance and First-Pass Quality. [S39] Because these three ratios multiply rather than average, a drop in machine availability imposes a hard ceiling on plant output regardless of operator sewing speed. [S39] Consider an illustrative sewing line where operators achieve 85 percent speed performance against Standard Allowed Minutes (SAM) and 95 percent first-pass quality, yielding 80.8 percent capability before downtime. If unaddressed mechanical breakdowns and power dips reduce machine availability to 72 percent across the shift, overall line effectiveness drops to 58.1 percent, erasing more than a fifth of nameplate capacity (derived arithmetic, illustrative model). [S39]

Cameroon's industrial history illustrates what happens when textile equipment runs without sustained preventive maintenance and capital renewal. [R12] Over the past three decades, the domestic market share of Cameroon's state-backed textile incumbent, Cotonniere Industrielle du Cameroun (CICAM), fell from roughly 85 percent to about 5 percent. [R11] [S34] According to a July 2023 operational audit, plant capacity utilisation stood at 33.7 percent at the Garoua complex, 48.9 percent at CICAM 1 in Douala, and 10.83 percent at CICAM 2. [R12] That underutilisation cost CICAM roughly CFAF 2 billion in 2020 alone and contributed to restructuring estimates ranging from CFAF 30.7 billion to CFAF 48.2 billion, alongside one cited relaunch plan of CFAF 70.2 billion. [R12] [R13] Section 4 of GFT's Feasibility Study identifies obsolete, poorly maintained machinery alongside raw-material shortages and import competition as the primary mechanism behind that collapse. [R12]

This maintenance deficit recurs across modern Sub-Saharan African apparel export zones. [S06] In the International Labour Organization's sector skills strategy for Ethiopia's garment industry, machine maintenance and repair is classified alongside

production management, industrial engineering, packaging and technical design as one of the five most acute skill shortages depressing factory productivity. [S06] Empirical surveys by Open African Innovation Research confirm that the cost of hiring foreign technicians is prohibitively high for domestic firms, starving local floors of diagnostic know-how. [S10] Even where foreign investors import expatriate technicians, field research shows that foreign firms routinely neglect training and technology transfer beyond minimum operational needs, leaving local staff unable to diagnose complex faults. [S09]

6.2 EXPERIMENTAL EVIDENCE CONFIRMS THAT PREVENTIVE MAINTENANCE DRIVES TEXTILE PROFITABILITY

Randomised controlled trials across multi-plant Indian cotton textile firms conducted by the National Bureau of Economic Research and Innovations for Poverty Action prove that structured maintenance discipline yields rapid financial returns. [S25] [S26] Introducing 38 management practices spanning preventive maintenance, quality logging, inventory control and incentives raised average plant productivity by 11 percent within four months and by 17 percent in the first year, adding roughly US$230,000 in annual profit per plant and enabling multi-plant expansion within three years. [S25] [S26]

In a greenfield Cameroonian cut-make-trim plant sized at an illustrative 3.0 million garments a year and 900 workers across 20 sewing lines, the machine fleet numbers roughly 750 industrial units: 640 direct line sewing heads, 30 vestibule training heads, 32 pre-calibrated standby float heads, and 48 spreading, cutting, fusing, pressing and metal-detection units (illustrative GFT plant model). [S05] Because apparel sewing resists full automation due to limp fabric distortion under needle and presser-foot forces, every line machine depends on tight synchronisation between human pedal input and high-speed steel kinematics. [S05] Running 750 machines on reactive breakdown repair guarantees chronic line starvation. [S0601]

6.3

Mean Time Between Failures and Mean Time to Repair govern sewing-floor reliability

A maintenance programme is only as effective as management's visibility into whether breakdown frequency and repair speed are improving shift by shift. [S0601] GFT's maintenance architecture governs the technical team through three quantitative reliability indicators recorded in the Line Log of the Performance-Management System (Deliverable 2, Section 4): Mean Time Between Failures (MTBF), Mean Time to Repair (MTTR) and the ratio of planned preventive hours to unplanned breakdown hours. [S38] [S39] [S0601]

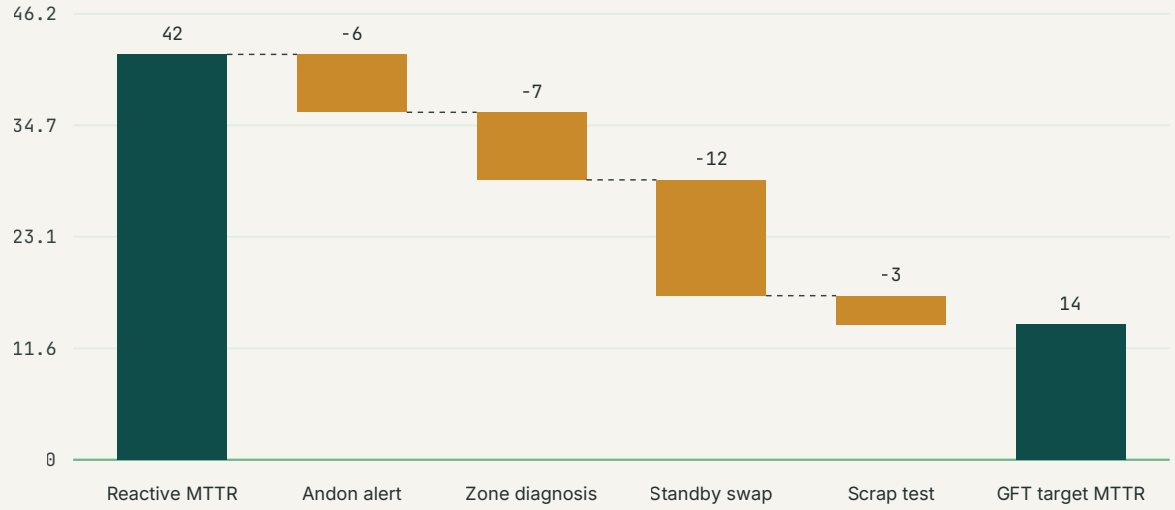
In textile reliability engineering, MTBF measures the average operational uptime elapsed between consecutive unplanned mechanical or electrical breakdowns of a repairable machine, excluding scheduled servicing and off-shift hours. [S39] Formally, MTBF equals total running uptime hours divided by unplanned breakdown events requiring mechanic intervention. [S39] Tracking MTBF by machine class reveals whether preventive lubrication and timing schedules are extending component life or whether premature wear and poor replacement parts are eroding reliability. [S0601]

Complementing MTBF, Mean Time to Repair (MTTR) measures the average elapsed time required to restore a failed sewing machine to full stitch-tested production. [S38] [S39] Computed by dividing total unplanned repair minutes by the number of repair events, MTTR runs from the minute the operator stops sewing to the minute she resumes producing first-pass-yield seams, encompassing four stages: [S38] [S39]

1. **Notification and response time:** elapsed minutes between the fault occurring, the operator flipping her station andon flag, and the zone mechanic arriving at the workstation. [S38]
2. **Diagnostic time:** minutes required by the mechanic to inspect the stitch fault or error code, isolate the root cause, and decide whether to repair inline or swap the head. [S38]
3. **Wrench or swap time:** active minutes spent fetching a part from the floor Kanban bin, recalibrating clearances, or rolling in a pre-calibrated standby machine head. [S38] [S0601]
4. **Verification and restart time:** minutes spent threading the machine, running a test seam on cotton scrap fabric, verifying stitch quality, and signing off the Line Log ticket. [S37] [S38] [S0601]

EXHIBIT 22 / MINUTES PER BREAKDOWN EVENT

Zone-mechanic response and a pre-calibrated standby head cut station repair delay from 42 minutes to 14 minutes



ILLUSTRATIVE [S38] [S39] [S0601] Illustrative maintenance engineering model based on MTTR stage definitions in S38, S39 and S0601. Opening step shows a 42-minute reactive breakdown (8 min notification, 10 min diagnosis, 18 min workshop parts fetch and inline wrench repair, 6 min stitch test); signed steps show minutes saved by station andon alert (-6 min), zone mechanic arrival (-7 min), wheeled standby head swap (-12 min) and pre-threaded scrap verification (-3 min), closing at 14 minutes.

As shown in **Exhibit 22**, p. 89, the shift from a reactive workshop model to GFT's zone-mechanic protocol determines whether a breakdown remains a brief station pause or cascades into a line stoppage. [S38] [S0601] Where mechanics sit in a distant workshop waiting for paper chits, an operator often waits 8 minutes to summon a

technician, followed by 10 minutes of diagnosis, 18 minutes of central store parts retrieval and inline strip-down, and 6 minutes of re-threading, totalling 42 minutes of dead station time (illustrative baseline). [S38] [S0601]

6.4 WHY PROGRESSIVE BUNDLE LINES STARVE AFTER TWENTY MINUTES OF CRITICAL-STATION DOWNTIME

In a garment line balanced via Ranked Positional Weight or Kilbridge-Wester heuristics to a 33-second workstation cycle time (109 pieces an hour at 100 percent efficiency), workstations are tightly coupled. [S31] To prevent hidden defects from accumulating inside large intermediate piles, GFT's supervisors cap work-in-progress (WIP) buffers between stations at two tied bundles of 20 pieces each, or roughly 22 minutes of sewing time (illustrative WIP cap based on 33-second cycle benchmark). [S31] [S37]

When a breakdown exceeds 20 minutes on a critical operation, such as a computerised bar-tacker, buttonholer or five-thread safety-stitch overlock, the two-bundle downstream buffer drains completely. [S31] [S0601] Every downstream operator then sits idle on full base pay while upstream stations halt once their two-bundle cap fills. [S0601] By compressing average MTTR from 42 minutes to 14 minutes (**Exhibit 22**, p. 89), GFT restores the station before downstream buffers run dry. [S38] [S39] While this waterfall model illustrates time compression for standard stitch heads, complex faults on automated spreading tables still require longer bench diagnostics and cannot be resolved through a head swap (illustrative boundary).

6.5

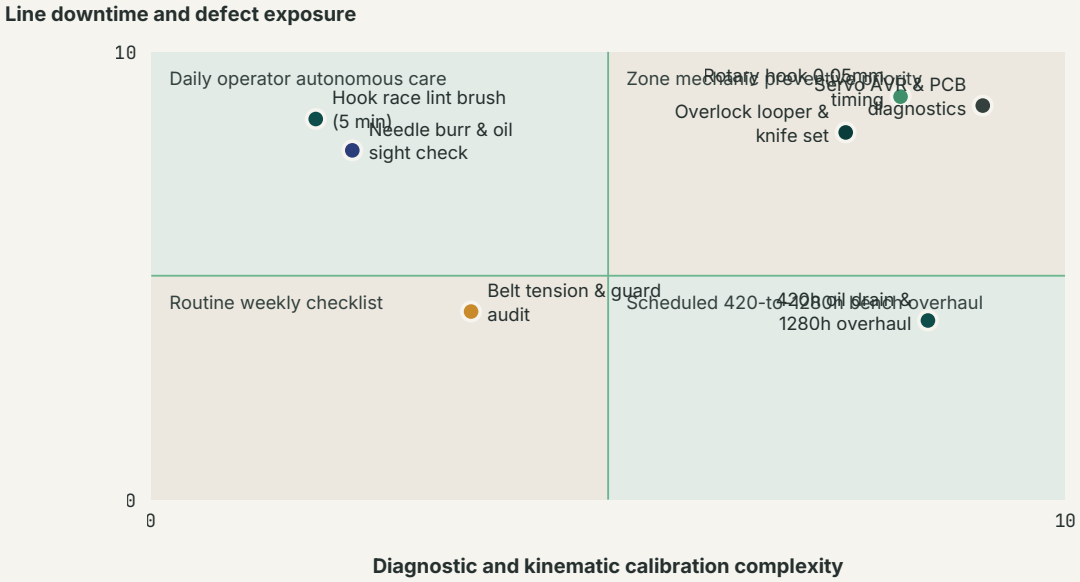
Total Productive Maintenance splits daily autonomous care from scheduled mechanic overhauls

New sewing machines rarely suffer major breakdowns during their first months of operation, creating a false sense that maintenance can wait. [S0601] Beneath the cover plates, however, cotton lint, sizing dust and metal wear accumulate from the first shift. [S0601] [S0602] Maintenance audits show that a small set of preventable causes drives most unplanned sewing stoppages: lint packed around the bobbin case, hook race and feed dogs; inadequate or dirty lubrication scoring shafts; needle burrs striking the throat plate; and unmonitored wear on consumable belts, knives and tension springs. [S39] [S0601] [S0602]

If skilled mechanics spend their shifts brushing cotton fluff from feed dogs or changing bent needles for 640 operators, they never complete scheduled timing overhauls. [S0601] GFT therefore enforces a three-tier Total Productive Maintenance (TPM) division of labour across operators, zone mechanics and bench specialists, mapped in **Exhibit 23**, p. 91. [S39] [S0601] [S0602]

EXHIBIT 23 / INDEX (0 TO 10)

Total Productive Maintenance assigns high-frequency lint and oil tasks to operators and precision kinematic calibration to mechanics



ILLUSTRATIVE [S39] [S0601] [S0602] Illustrative maintenance governance matrix based on S39, S0601 and S0602. Horizontal axis scores required diagnostic and gauge complexity (0 = visual or brush task, 10 = sub-millimetre kinematic or electronic bench calibration); vertical axis scores immediate line downtime and defect exposure if neglected (0 = low, 10 = severe line stoppage).

As structured in **Exhibit 23**, p. 91, the upper-left quadrant captures high-exposure, low-complexity tasks assigned to the operator under Autonomous Maintenance. [S0601] During Week 1 of GFT's Vestibule Training Dojo curriculum (Chapter 10), every recruit learns a mandatory five-minute autonomous routine at the start and end of each eight-hour shift (illustrative standard based on industry checklists): [R16] [S35] [S0601]

- **Lint evacuation:** opening the slide plate to brush cotton lint and thread fuzz from the feed-dog teeth, bobbin case, tension discs and hook raceway. [S0601] [S0602]
- **Lubrication sight check:** checking the oil-level sight glass and return window, and applying specified mineral oil to manual red-marked points without over-oiling the needle bar. [S37] [S0601] [S0602]
- **Needle integrity check:** inspecting the needle point and eye for burrs or bending that cause skipped stitches, fabric damage or throat-plate strikes. [S0601]
- **Scrap stitch verification:** sewing a 10-centimetre test seam on scrap cotton fabric to confirm balanced tension before touching a production bundle. [S37] [S0601]

6.6 SCHEDULED WEEKLY INSPECTIONS, 420-HOUR OIL CHANGES AND 1,280-HOUR BENCH OVERHAULS

Transferring daily cleaning to operators frees GFT's 12 mechanics to execute the right-hand quadrants of **Exhibit 23**, p. 91: weekly zone checks, 420-hour oil changes and 1,280-hour kinematic overhauls. [S39] [S0601] [S0602] While **Exhibit 23**, p. 91 maps task responsibility, mechanics must consult manufacturer service manuals for model-specific clearances.

Each week, the zone mechanic conducts a 20-minute inspection per machine on staggered schedules: cleaning interior linkages, checking belt tension, inspecting overlock knives, and verifying that needle guards, belt covers and emergency stops comply with the ILO Code of Practice. [S40] [S0601] At deeper intervals tracked in the Line Log, textile maintenance benchmarks set two hard milestones. [S0602] Every 420 running hours (roughly ten weeks at Cameroon's 40-hour week), the mechanic drains the oil reservoir completely, flushes metallic swarf from the pump screen, and refills the sump with laboratory-verified sewing oil checked twice weekly. [R16] [S0602] Every 1,280 running hours (about six months), the head rotates to the bench for a complete overhaul: inspecting bushings, recalibrating rotary-hook timing and feed-dog synchronisation with gauges, and updating the machine's service passport. [S0601] [S0602] If mechanics spend more than 30 percent of shift hours on unplanned breakdowns rather than the 420-hour and 1,280-hour calendar, the weekly plant review triggers corrective action (Deliverable 2, Section 5, illustrative threshold). [S0601]

6.7

Electromechanical protection shields direct-drive servo electronics against grid instability

Modern garment factories rely on solid-state power electronics. [S0603] Traditional three-phase AC induction clutch motors spin continuously at 2,850 revolutions per minute (RPM) once switched on, drawing roughly 400 watts whether the operator is stitching or aligning fabric. [S0603] Because an operator spends 65 to 92 percent of her cycle handling limp fabric while the needle is at rest, a clutch motor wastes power across four-fifths of the shift, operates below 75 percent electrical efficiency, radiates heat, and suffers starting overloads. [S05] [S0603]

GFT specifies computerised direct-drive brushless DC servo motors with needle synchronisers and automatic under-bed thread trimmers (UBTs) across its sewing fleet (illustrative specification). [S0603] Operating at 80 to 95 percent efficiency from 400 to 4,000 RPM, a servo motor enters standby mode when the shaft stops, drawing just 0.1 to 1.8 amperes (about 1 watt). [S0603] Because power draw scales with speed, running a 550-watt servo motor at 2,000 RPM consumes 275 watts during active stitching, cutting sewing-floor electricity use by 40 to 60 percent and lowering energy intensity per unit in the Sustainability KPI family (Deliverable 2, Section 3). [S0603] Servo synchronisers and UBTs also automate back-tacking, presser-foot lift, needle positioning and thread trimming, freeing both hands to guide cotton plies and saving up to 5 percent of cycle time. [S0603]

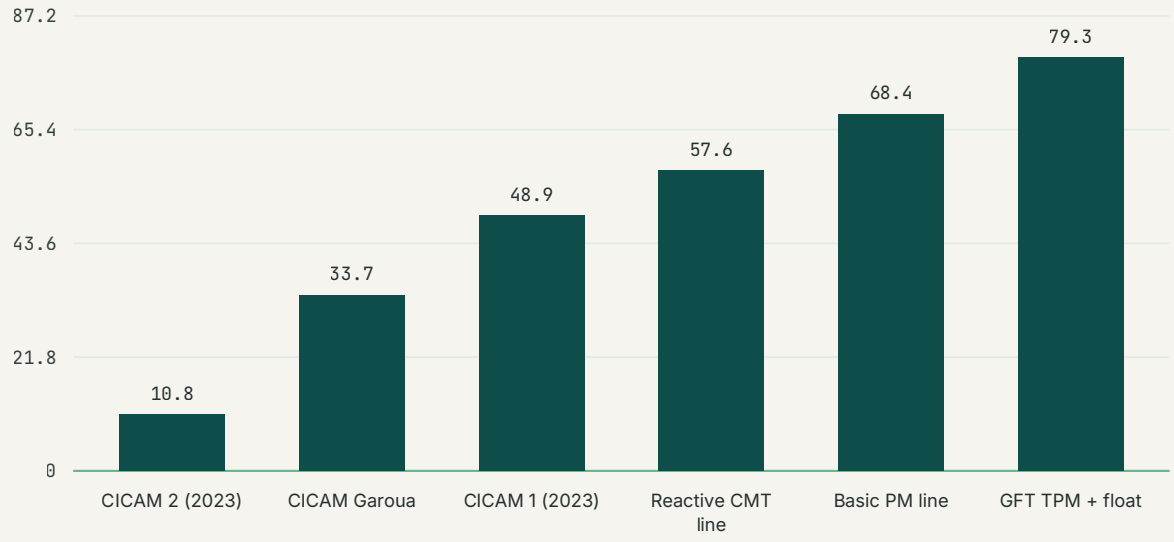
6.8 WHY CAMEROON'S POWER GRID THREATENS UNPROTECTED SERVO CONTROL BOARDS

The vulnerability of direct-drive servo machines lies in their under-table printed-circuit control boxes, optical encoders and solenoid drivers. Section 10 and Section 11 of GFT's Feasibility Study and Section 6 of the Digital Strategy flag power grid instability as a primary risk in Cameroon across both the Douala-Dibamba corridor and the northern Garoua belt. [R09] [R10] Voltage sags, restoration surges and generator transfer transients burn out unprotected varistors, capacitors and microcontrollers, turning a brief brownout into weeks of downtime if replacement boards must be imported (illustrative risk assessment). [S10] [S0601] GFT engineers three defences:

- **Line power conditioning:** every sewing line busbar runs behind a three-phase industrial Automatic Voltage Regulator (AVR) with surge clamping and ILO-compliant earthing, while computerised tackers, buttonholers and Tier-1 edge computer-vision cameras run on online double-conversion Uninterruptible Power Supplies (UPS) during generator changeover (Deliverable 3, Section 5). [R29] [S40]
- **Monthly electrical checks:** mechanics inspect earth straps, vacuum cotton dust from controller vents, and verify terminal torque. [S40] [S0601]
- **Board-level repair:** GFT trains local electrotechnical mechanics to test rectifier bridges and Hall-effect pedal sensors with multimeters and replace sacrificial fuses, varistors and capacitors on the bench rather than discarding US$180 control boxes (illustrative curriculum). [S42]

EXHIBIT 24 / PERCENT

Preventive maintenance and standby machine floats lift sewing line Overall Equipment Effectiveness above 78 percent



DERIVED [R12] [R29] [S31] [S39] Compares CICAM July 2023 reported plant capacity utilisation across CICAM 2 (10.83%), Garoua (33.7%) and CICAM 1 (48.9%) from R12 with derived garment-line OEE (Availability x Performance x Quality) under reactive maintenance (82% availability x 78% performance x 90% quality = 57.6% OEE), basic mechanical PM (89% x 82% x 93.7% = 68.4% OEE) and GFT's TPM, standby-float and edge-vision target (95% availability x 86.5% balanced performance from S31 × 96.5% first-pass yield from R29 = 79.3% OEE, illustrative operating model).

Exhibit 24, p. 93 shows how mechanical and electronic availability protection combines with line balancing (Chapter 5) and inline quality control (Chapter 7) to protect utilisation. [R12] [R29] [S31] [S39] Against CICAM's July 2023 plant utilisation of 10.83 to 48.9 percent, a reactive garment line with 82 percent availability, 78 percent performance and 90 percent quality stalls at 57.6 percent OEE. [R12] [S39] Basic weekly servicing lifts availability to 89 percent (68.4 percent OEE), while GFT's full TPM, AVR/UPS protection and 5 percent standby float hold availability at 95 percent, combining with 86.5 percent balanced performance and 96.5 percent vision-assisted first-pass yield to reach 79.3 percent OEE (**Exhibit 24**, p. 93). [R29] [S31] [S39] Note that CICAM's figures measure spinning and weaving plant utilisation from the 2023 audit, whereas the right-hand bars model sewing OEE in GFT's illustrative cut-make-trim design. [R12]

6.9

Two-bin spare-parts Kanban and preventive discipline contain euro-pegged import exposure

Every maintenance failure in Cameroon carries a foreign-exchange and customs consequence. [R32] The Central African CFA franc (XAF) is pegged to the euro at 655.957 XAF per EUR, trading near 590 to 610 XAF per US dollar in the 2024 study window and 563 to 577 XAF per US dollar in 2026 refreshes (Feasibility Study Method Note). [R32] While domestic and CEMAC garment sales earn CFA francs, virtually 100 percent of precision wear parts (rotary hooks, loopers, needles, feed dogs, throat plates, knives and servo boards) are imported through Douala port and priced in US dollars, euros or yuan (illustrative sourcing baseline). [R32]

6.10 HOW POOR MAINTENANCE AND UNSKILLED ADJUSTMENTS DOUBLE SPARE-PART BURN RATES

Neglecting autonomous care and gauge calibration doubles imported spare-part consumption: [S0601] [S0602]

- Unbrushed cotton lint mixed with degraded oil forms an abrasive paste inside the rotary hook raceway, ruining a US$28 hook in 400 hours instead of its 1,280-hour service life (illustrative wear comparison). [S0601] [S0602]
- Sewing heavy cotton twill with a bent needle or wrong needle size strikes the throat plate and hook point, snapping needles and gouging the stitch hole. [S0601]
- Setting overlock looper clearance by eye rather than with a 0.05-millimetre feeler gauge causes high-speed looper collisions at 4,000 RPM, snapping both loopers after restart (illustrative tolerance). [S39] [S0601]

GFT pairs preventive maintenance with a two-bin floor Kanban and a 90-day central customs buffer sized from MTBF formulas, shown in **Exhibit 25**, p. 95. [R32] [S39] [S40] [S0601] [S0602]

EXHIBIT 25 / 750-MACHINE FLEET

Critical sewing-machine spare-parts Kanban and CFA franc foreign-exchange buffer policy

Component class	Service / MTBF interval	Floor two-bin trigger	Central buffer	FX & control rule
Lockstitch & overlock needles	32 to 48 running hours	500 needles per bin	90 days (45,000 pcs)	1-for-1 broken fragment swap (S40)
Rotary hooks & bobbin cases	1,280 running hours	15 sets per bin	90 days (90 sets)	EUR contract parity (655.957 XAF, R32)
Overlock loopers & needle guards	1,280 running hours	12 pairs per bin	90 days (75 pairs)	0.05 mm gauge check before issue
Feed dogs, throat plates & knives	640 to 960 hours	20 sets per bin	90 days (120 sets)	Re-grind upper/lower knives twice
Lubrication oil & V-belts	420 hours oil drain	40 litres / 25 belts	90 days (240 L)	Lab-verified viscosity grade (S0602)
Direct-drive servo PCBs & encoders	3,500+ hours (AVR)	6 modules per bin	120 days (24 units)	AVR + UPS mandatory against grid sags

DERIVED [R32] [S39] [S40] [S0601] [S0602] Derived spare-parts inventory policy for an illustrative 750-machine Cameroonian garment plant, combining failure and service intervals from S39, S0601 and S0602 with broken-needle safety controls (S40) and euro-pegged CFA franc (655.957 XAF/EUR, R32) Douala port replenishment buffers.

In **Exhibit 25**, p. 95, each zone mechanic cart carries a two-bin Kanban cassette for high-runner consumables. [S0601] When Bin A empties, the mechanic draws from Bin B and drops the Bin A card at the central store for same-day refill, eliminating 18-minute workshop walks (**Exhibit 22**, p. 89). [S38] [S0601] Central stock holds a 90-day buffer (120 days for servo PCBs) to absorb Douala customs lead times without emergency air freight, while framework contracts for European needles, hooks and oils are denominated in euros to lock costs to the 655.957 XAF per EUR peg. [R32] Actual burn rates vary with fabric weight and are recalibrated quarterly against logged MTBF hours (illustrative policy). [S39] [S0601]

METHOD

Calculating spare-parts Kanban bin sizes and MTBF buffer stock

GFT sizes spare-part buffers in the companion Excel pack using three operational equations: [S39] [S0601] [S0602]

1. **Monthly component demand (`Dm`):** for `N` active machine heads running `Hm` hours a month (173.3 hours at Cameroon's statutory 40-hour week) with scheduled service or MTBF interval `T_service`, monthly demand equals `Dm = (N x Hm) / T_service`. [R16] [S39] [S0602]
2. **Central customs buffer (`B_central`):** for a customs and shipping replenishment horizon of `L_days` (90 days for mechanical wear parts or 120 days for electronic modules) and a greenfield ramp safety factor of `k = 1.25`, central buffer stock equals `B_central = Dm x (L_days / 30) x k` (illustrative formula). [S39]
3. **Broken-needle reconciliation:** zero replacement needles are issued from the floor Kanban bin without returning the worn needle or all physical fragments of a broken needle taped to the Broken-Needle Log card, reconciled daily against packing-line metal-detector tunnel checks. [S40]

6.11

Zone mechanic ratios and pre-calibrated standby floats cap station downtime below fifteen minutes

In ILO surveys of African garment firms, technicians represent 8.7 percent of the workforce alongside 4.4 percent managers and 66.2 percent operators. [S08] While one mechanic can support several dozen well-maintained machines once preventive routines mature, greenfield plants require tighter coverage so breakdowns never crowd out scheduled servicing. [S0601]

In GFT's illustrative 900-person workforce plan (Chapter 13), the maintenance team comprises 12 local sewing and plant mechanics plus 1 chief maintenance engineer, mentored in Phase 0 and Phase 1 by 2 imported master mechanics (illustrative organogram). [S08] Across 750 total machines, 12 mechanics equal 1 mechanic per 62.5 machines (1 per 53.3 active line heads across 640 line stations, tightened to 1:45 on complex woven uniform lines and 1:64 on basic knit lines, illustrative allocation). [S0601]

6.12 FLOOR-ZONE STATIONING, THE THREE-MINUTE ANDON RULE AND THE FIFTEEN-MINUTE STANDBY SWAP

GFT stations two mechanics permanently in each four-line floor zone across the 20 lines, with two mechanics at the overhaul bench and cutting bay (illustrative layout). When a fault occurs, response follows four timed steps linked to the Traffic Light System (Chapter 7) and Line Log (Deliverable 2, Section 4): [S37] [S38]

1. **Zero-minute stop and andon alert:** the operator stops immediately, flips her station andon flag, and notes the stop time on her bundle ticket. [S37] [S38]

2. **Two-to-three-minute zone arrival:** the aisle-stationed mechanic arrives within 3 minutes with gauges and Kanban cart to diagnose the fault (**Exhibit 22**, p. 89). [S38]
3. **The 15-minute wrench rule and standby swap:** faults taking under 10 minutes of wrench time are fixed inline followed by a 3-minute scrap stitch test. [S38] [S0601] If a repair will exceed 15 minutes (such as a seized hook shaft, broken looper carrier or faulted PCB), the mechanic unplugs the table, rolls out the faulted unit, and rolls in a pre-calibrated machine head from the zone's 5 percent spare float (32 standby heads plant-wide, illustrative standard).
4. **Restart and CAPA logging:** the operator resumes sewing within 14 total minutes, preserving the 22-minute two-bundle WIP buffer downstream while the faulted head goes to the bench and is logged in the Line Log and weekly CAPA register. [S31] [S38] [S39]

WORKED EXAMPLE

Quantifying the true hourly and annual cost of sewing-machine downtime on an illustrative 32-operator Cameroonian line

Comparing maintenance budgets only against mechanic wages ignores the lost contribution margin and cascading idle payroll of a stalled line. [S0601] Using textile downtime cost equations and Cameroon's statutory wage benchmarks, GFT models the savings from compressing MTTR from 42 minutes to 14 minutes across an illustrative 20-line, 900-person plant: [R14] [R16] [S39] [S0601]

1. Cited and assumed inputs (illustrative case):

- **Wage baseline:** Cameroon's SMIG is XAF 43,969 a month from 23 February 2024 (about US$76) for a 40-hour week (173.3 hours a month), or XAF 253.7 (US$0.44) per hour base and an illustrative US$0.65 per hour fully loaded. [R14] [R16]
- **Line geometry:** 20 lines of 32 stations balanced to a 33-second cycle time (109 pieces/hour at 100 percent efficiency, or 87.2 pieces/hour at an illustrative 80 percent efficiency), with a 20-minute two-bundle WIP buffer and an illustrative US$1.35 contribution margin per shirt. [S31] [S37]
- **Breakdown rate:** reactive lines suffer an illustrative 12 breakdowns/month at 42 minutes MTTR (**Exhibit 22**, p. 89); GFT's TPM and standby swap cut frequency to 6 events/month at 14 minutes MTTR. [S38] [S0601] [S0602]

2. Illustrative cost per breakdown event:

- **42-minute (0.70-hour) reactive stoppage at Station 16:** after the 20-minute downstream buffer drains, 16 downstream stations starve for 22 minutes (0.367 hours), losing `0.367 x 87.2 = 32.0` garments (**US$43.20** in lost contribution margin at US$1.35 per unit) and idling `0.70 + (16 x 0.367) = 6.57` operator-hours (**US$4.27** in idle payroll at US$0.65 per hour), for a **total cost of US$47.47** (about XAF 28,480) per breakdown versus US$1.40 in mechanic repair labour. [R14] [R32] [S39] [S0601]
- **14-minute (0.233-hour) GFT standby swap:** the station restarts 6 minutes before the 20-minute buffer empties, causing zero downstream starvation and costing **US$3.25 per event** in single-station delay and buffer recovery (illustrative calculation). [S38] [S0601]

3. Illustrative annual plant savings (20 lines):

- Reactive baseline: `2,880 breakdowns/year x US$47.47 = US$136,714` in downtime losses plus US$24,000 in excess spare-part wear, totalling **US$160,714 a year** (about XAF 96.4 million). [R32] [S0601]
- GFT TPM and Standby Swap: `1,440 events/year x US$3.25 = US$4,680 a year`, yielding **US$156,034 a year (about XAF 93.6 million) in net cost avoidance**, covering the annual salaries of all 12 local mechanics more than three times over (illustrative arithmetic; not a forecast). [R14] [R32] [S0601]

6.13

Sixteen-week apprenticeships convert Cameroonian TVET graduates into certified sewing mechanics

Cameroon operates 729 public technical secondary schools (MINESEC), 41 post-secondary technological institutes (MINESUP) and over 1,600 vocational training centres (MINEFOP) graduating thousands of students in general mechanics and electrotechnics. [S42] However, industrial employers report that TVET graduates lack practical readiness on modern factory equipment, and almost none are trained in industrial sewing kinematics. [S16] [S42] Meanwhile, in an economy where 89.5 percent of workers are informal (66.9 percent self-taught and 24.4 percent trained in small workshops), informal roadside mechanics possess manual dexterity but lack precision-gauge training and formal credentials. [R16] [S19] [S42]

6.14 DUAL-STREAM RECRUITMENT AND THE SIXTEEN-WEEK MASTER-MECHANIC APPRENTICESHIP

In Phase 0 (Months -4 to 0), GFT recruits 16 mechanic trainees to certify 12 permanent mechanics (a 25 percent selection margin, illustrative cohort model, Chapter 13): 10 formal BTS/DUT/DTS electrotechnical graduates (Stream A) and 6 experienced informal mechanics screened via practical bench trials and enrolled in MINEFOP's Recognition of Prior Learning (RPL) track for national DQP/DTS certification (Stream B). [S08] [S16] [S19] [S42]

Paired with two imported master mechanics on 18-month handoff contracts and structured under the World Bank and MINEFOP PADESCE competency-based training (CBT) framework for voucher co-financing, the 16-week (640-hour) apprenticeship covers four blocks: [S09] [S17] [S18]

1. **Weeks 1 to 4 (Tier-1 Basic Stitch Heads):** stripping and rebuilding single-needle lockstitch and 3/4/5-thread overlock heads to feeler-gauge tolerances (0.05 mm rotary-hook-to-needle clearance, needle-bar stroke height, feed-dog tilt and looper timing, illustrative factory tolerances). [S39] [S0601] [S0602]
2. **Weeks 5 to 8 (Tier-2 Specialty and Automatic Machines):** flatbed and cylinder-bed interlocks, eyelet buttonholers, computerised bar-tackers, fusing presses and spreading/cutting tables. [S05] [S39]
3. **Weeks 9 to 12 (Tier-3 Servo Electronics and Vision Hardware):** ILO electrical safety and lockout-tagout, three-phase AVR and UPS maintenance, servo controller programming, PCB component replacement, and Tier-1 edge computer-vision camera hardware care. [R29] [S40] [S0603]
4. **Weeks 13 to 16 (Vestibule Floor Practicum and PMS Logging):** live zone coverage in the Vestibule Dojo, practicing 3-minute andon response, 8-minute standby swaps, 420-hour oil drains, Kanban management, and MTBF/MTTR logging in the PMS Excel pack (Deliverable 2, Section 4). [S35] [S38] [S39] [S0602]

GFT NOTE

Practical recommendation: gate Phase 1 line start-up on blind 14-minute MTTR bench and swap certification (illustrative gate standard)

In Section 12 of GFT's Feasibility Study, Phase 1 launch is gated on certifying the initial technical cohort. For mechanics, GFT mandates a blind Week-16 practical exam: the master mentor plants five concealed faults across a lockstitch head, a five-thread overlock head and a servo PCB (such as retarding hook timing by 1.5 mm, misaligning the looper guard, dulling the knife, tilting the feed dog and inserting a blown varistor). To enter Band 4, each trainee must recalibrate the stitch faults on SODECOTON cotton swatches within 12 minutes using feeler gauges and complete a wheeled standby-head swap within 8 minutes. [R03] [S38] [S39] Thirty percent of the master mentors' completion bonus remains in escrow until all 12 local mechanics pass Tier-1 to Tier-3 certification and hold plant availability at or above 94 percent for 60 consecutive shifts without expatriate intervention (illustrative contract rule). [S09]

6.15 INTEGRATING MAINTENANCE LOGS INTO THE PERFORMANCE-MANAGEMENT SYSTEM AND DIGITAL STRATEGY

Every time a zone mechanic answers an andon flag or completes a 420-hour service, he logs machine ID, start/restart timestamps, fault code (M01 to M07) and spare part used in the Line Log downtime register (Deliverable 2, Section 4). [S38] [S39] Those records drive daily huddle checks on stations exceeding 15 minutes of downtime and weekly plant review CAPA tickets on repeat breakdown causes (Deliverable 2, Section 5 and Section 6). [S38] [S0601] By Phase 3, 12 months of clean MTBF and part-life history in the core data store enable predictive maintenance, flagging heads whose stitch-defect and adjustment trends signal impending wear before an in-shift breakdown occurs (Deliverable 3, Section 4 and Section 7). [S39] [S0601]

A sewing line is only as fast as the wrench that keeps its slowest needle in time.

CHAPTER SOURCE NOTES

S0601 ORDNUR. 2026-09-08.

S31 Hawassa University (Ethiopian Journal of Engineering and Technology). 2023.

R12 Business in Cameroon. Publication date unrecorded; inherited source-text check.

R32 Wise; XE. Publication date unrecorded; inherited source-text check.

S38 IBM. 2024.

S39 TextileSchool. 2025-07-22.

R11 Business in Cameroon; MMI News. Publication date unrecorded; inherited source-text check.

S34 Societe Nationale d'Investissement du Cameroun (SNI). 2024.
R13 Business in Cameroon; MMI News. Publication date unrecorded; inherited source-text check.
S06 International Labour Organization (ILO). 2019-08-26.
S10 Open African Innovation Research (OpenAIR). 2021-02-17.
S09 Open African Innovation Research (OpenAIR). 2021-02-17.
S25 National Bureau of Economic Research (NBER). 2011-01.
S26 Innovations for Poverty Action (IPA). 2013.
S05 International Labour Organization (ILO). 2022.
S37 Fibre2Fashion. 2013.
S0602 Textile Learner (Hindustan University Department of Fashion Design and Arts). 2014-11-22.
R16 WageIndicator. Publication date unrecorded; inherited source-text check.
S35 Online Clothing Study. 2019.
S40 International Labour Organization (ILO). 2022.
S0603 HighTex / StitchWorld. 2023-08-08.
R09 Ecofin Agency. Publication date unrecorded; inherited source-text check.
R10 Ecofin Agency. Publication date unrecorded; inherited source-text check.
R29 MDPI; industry inspection literature. Publication date unrecorded; inherited source-text check.
S42 International Labour Organization (ILO). 2020.
S08 International Labour Organization (ILO). 2019-08-26.
R14 WageIndicator. Publication date unrecorded; inherited source-text check.
S16 North American Academic Research (TWASP). 2021.
S19 International Labour Organization (ILO). 2026.
S17 Cameroon Ministry of Employment and Vocational Training (MINEFOP / JEME). 2025.
S18 World Bank (International Development Association). 2020-07.
R03 SODECOTON. Publication date unrecorded; inherited source-text check.

GREEN FUTURE TECH
LIMITED / HONG KONG SAR

07

Quality Leads Bridge Inline Traffic-Light Patrols and Edge Computer Vision

Manual inspection catches only 60 to 70 percent of fabric and garment defects; GFT trains quality technicians to pair source-level Traffic Light System sewing patrols with edge computer-vision cameras that exceed 90 percent accuracy. [R29]

CHAPTER 07
DECISION TEST

Manual inspection catches only 60 to 70 percent of fabric and garment defects; GFT trains quality technicians to pair source-level Traffic Light System sewing patrols with edge computer-vision cameras that exceed 90 percent accuracy. [R29]

The quality lead's task is not to choose between people and cameras. It is to shorten the time between a defect appearing and an authorised person stopping its recurrence. Green Future Tech's three-part Cameroon textile programme therefore joins three controls into one operating loop: Traffic Light System (TLS) patrols at the sewing station, edge computer vision at suitable fabric and garment surfaces, and a Quality Log that converts both signals into corrective action. Published inspection benchmarks put manual detection at 60 to 70 percent and computer vision above 90 percent across more than 40 defect types, but these figures are not a promise of performance on Cameroonian cotton, a new style or a particular camera installation. [R29] GFT's answer is a human-led system in which locally tested models widen coverage, roving technicians protect three-dimensional seam quality, and final acceptance sampling verifies lots rather than rescuing an unstable process. The quality lead owns this bridge from the first shift.

7.1

End-of-line inspection arrives after the defect has already multiplied

End-of-line inspection remains necessary, but it is a poor primary defence against a repeating sewing fault. A tension error, damaged needle or misunderstood seam specification can reproduce across every subsequent bundle while the operation continues. TLS is designed to interrupt that sequence at source rather than wait for a finished garment to reveal it. [S37] The relevant economic variable is therefore detection latency: the production time between the first defective piece and the first effective containment decision. Every additional minute adds units to the population that may need sorting, repair or rejection.

Manual final inspection also has a detection ceiling. The shared evidence register records manual accuracy of 60 to 70 percent, with 20 to 30 percent of defects missed. [R29] A peer-reviewed fabric-inspection study published in 2008 gives a more conditional benchmark: experts could not detect more than 60 percent of overall defects when fabric moved faster than 30 metres a minute or was wider than 2 metres. [S0702] These observations concern different inspection settings and must not be blended into one universal rate. They do establish the design principle: final manual inspection cannot be treated as a complete barrier, especially where speed, width, fatigue and presentation conditions vary.

The cost of late detection extends beyond the minutes spent unpicking a seam. A defective completed garment has already absorbed cutting, handling, every preceding sewing operation, bundle movement and finishing capacity. Repair can disturb adjacent stitches, fabric appearance and measurements, while sorting consumes additional labour even when no defect is found in a checked piece. The quality lead must consequently measure exposure at the workstation where the cause lives, not only at the end table where the symptoms become visible. TLS supplies that earlier observation point, and its visual cards make the required response explicit to production and quality staff. [S37]

WORKED EXAMPLE: DETECTION LATENCY SETS THE SORTING AND REPAIR BURDEN

This constructed example compares two responses to the same repeating station fault. Assume an illustrative operation produces 60 pieces an hour, 8 percent of pieces become defective after the fault starts, a full check takes one minute per piece and repair takes 12 minutes per defective piece. If discovery takes two hours, the containment population is 60 × 2 = 120 pieces. Expected defective pieces are 120 × 0.08 = 9.6, so sorting and repair require 120 + (9.6 × 12) = 235.2 minutes. If a patrol discovers the same fault after 30 minutes, exposure is 30 pieces, expected defects are 2.4 and total sorting and repair time is 30 + (2.4 × 12) = 58.8 minutes. The illustrative difference is 176.4 minutes for one event. These are planning assumptions, not measured GFT results, and fractional expected defects represent an average across repeated events.

The calculation does not prove that more frequent inspection is always worthwhile. Patrol labour, production interruption and the probability that a fault begins just after a check all matter. It shows why the quality lead should compare the cost of a patrol route with the exposure it removes. A shorter interval is most valuable at operations whose defects replicate quickly, are difficult to detect downstream or carry safety consequences. Stable, low-risk operations may justify a different cadence after local evidence accumulates.

Shop-floor quality loops can also improve wider operating performance. In the ILO SCORE pilot in Brazil, subcontracted sewing workshops reported a 15 percent average productivity increase and a 12 percent reduction in rework rates, based on SENAI data. [S21] That result came from a broader methodology covering management, communication, workplace organisation and production processes, not from TLS or computer vision alone. [S21] It supports investment in structured quality work, but it must not be presented as the expected effect of installing a camera.

For GFT's Cameroon textile programme, Right First Time quality is therefore an operating requirement rather than a final-audit slogan. Institutional and repeat buyers judge the garments that arrive, while the factory bears the sorting and repair burden created upstream. The quality lead protects both by making detection time, containment scope and verified closure visible in the same routine.

7.2

Traffic-Light patrols convert a sewing fault into an immediate station decision

The Traffic Light System is a random inline inspection method that places Green, Yellow or Red cards at the workstation. Fibre2Fashion describes checks of semi-finished pieces from the current bundle once every hour or two, with one inline checker covering 15 or 20 workstations. Its checks include stitches per inch, seam width, sewing allowance, trim placement and measurements. [S37] The source's example assigns Green when no rework is found, Yellow at two or more defective items out of ten and Red at five or more out of ten. It also states that factories alter sample sizes and thresholds to suit their quality targets. [S37] Those thresholds are examples, not a universal standard.

GFT's illustrative commissioning protocol uses four patrols per eight-hour shift and a seven-piece sample from the current bundle. Green means zero defects in that sample, Yellow means one or two non-critical defects and Red means three or more defects, or one critical defect. Cameroon's standard working week provides the shift context, while the actual route must respect legally applicable working-time and break requirements. [R16] The seven-piece rule is deliberately labelled as a local starting design. The quality lead must revise it against buyer requirements, defect risk and observed process capability rather than treating it as a sourced industry norm.

Randomness needs operational discipline. The inspector should draw pieces from different positions in the current bundle without letting the operator preselect them, and patrol times should vary enough to avoid a predictable performance for the camera or card. The inspector records the bundle and style identifiers so that a Red result can be traced to all pieces produced since the last accepted check. A Green card means only that the sampled pieces contained no observed defect under that inspection method. It does not prove that the station is incapable of producing a defect.

Yellow is a coaching and verification signal. The inline inspector identifies the exact deviation, the operator corrects the next piece, and the line supervisor checks whether the cause lies in method, material or machine setup. Red is a containment signal. The operation stops, the suspect population is quarantined, and the line supervisor, zone mechanic and quality lead decide who must act. GFT's illustrative restart rule requires five consecutive defect-free pieces after correction. A card cannot be cleared merely because production is behind target.

The protocol also needs protection against social display. A station card communicates process status; it must not become a public ranking of personal worth or a reason for intimidation. The quality lead audits whether inspectors apply the same defect definitions across operators and shifts. Recurring Yellow or Red results trigger training, method engineering or maintenance, not automatic punishment. This is consistent with the source's emphasis on immediate corrective action and clarification of quality requirements at the operation. [S37]

Exhibit 26, p. 106 assigns the decision rights for GFT's proposed patrol and escalation routine. The thresholds are illustrative and intentionally distinct from the source example.

EXHIBIT 26 / GFT ILLUSTRATIVE STATION PROTOCOL

Quality leads turn each inspection signal into containment, correction and a named record owner

Signal	Illustrative trigger	Immediate decision	Accountable owner and record
Green	0 defects in 7 pieces	Continue operation; retain trace	Inline inspector logs station, bundle and time
Yellow	1 to 2 non-critical defects	Coach; verify next pieces	Operator and supervisor close method check
Red	3+ defects or 1 critical defect	Stop; quarantine since last accepted check	QA lead owns containment and restart evidence
Vision alert	Model exceeds approved threshold	Human review; hold affected map region	Vision technician confirms or relabels event
Lot audit failure	Acceptance criterion exceeded	Hold shipment; tighten process review	QA manager owns lot disposition and CAPA

ILLUSTRATIVE [S37] [R29] [S0701] Illustrative GFT protocol informed by TLS source inspection in S37, vision-assisted detection in R29 and lot acceptance concepts in S0701. The seven-piece sample and Green 0, Yellow 1 to 2 and Red 3+ thresholds are commissioning assumptions, not thresholds stated by S37 or universal buyer requirements. Critical defects bypass numeric sample thresholds.

The table separates detection from disposition. An inline inspector can place a card and preserve evidence, but the quality lead controls release after a Red event. The line supervisor restores flow only after the technical cause and the quarantined population have been addressed. The zone mechanic owns machine correction where relevant, while the industrial-engineering technician owns an unrealistic method or work standard. This prevents production urgency from silently overriding quality authority.

A final limitation matters: patrol sampling cannot guarantee zero defects between checks. Its value lies in earlier warning, clear containment and organisational learning. Where a critical defect can cause injury, the control plan must require immediate stop and containment on discovery, regardless of sample counts or the next scheduled patrol.

7.3

DHU and First-Pass Yield answer different questions in the Quality Log

A usable quality record must distinguish the number of defects from the number of garments affected. Defects per Hundred Units (DHU) counts every recorded nonconformity, divides by units inspected and multiplies by 100. ISO 2859-1 uses the same fundamental distinction between nonconforming items and nonconformities per 100 items, and notes that one item may contain more than one nonconformity. [S0701] First-Pass Yield (FPY), in GFT's internal Quality Log definition, counts units that pass without repair, stain removal or stitch alteration and divides them by all units presented for first inspection. DHU measures defect frequency; FPY measures the flow of units through the process without a second touch.

An illustrative inspection of 250 units that finds 20 individual defects produces DHU of 20 ÷ 250 × 100 = 8.0. If 232 units pass on their first presentation, FPY is 232 ÷ 250 × 100 = 92.8 percent. The two results are not complements. Eighteen units failed first pass in this example, but twenty defects were counted because some units carried more than one defect. Adding DHU and FPY would therefore be a category error. The Quality Log must preserve both measures with the same unit population, inspection boundary and time period.

The minimum useful record contains more than a total. Each event needs a timestamp, line, workstation, style, bundle or roll identifier, defect code, severity, inspection stream and disposition. Human observations and camera alerts use the same defect taxonomy, but the source stream remains visible so that detection performance can be compared honestly. A vision event also retains its model version and a reference to the review image or bounding-box metadata. A corrective-action record then names the accountable owner and the evidence required before closure.

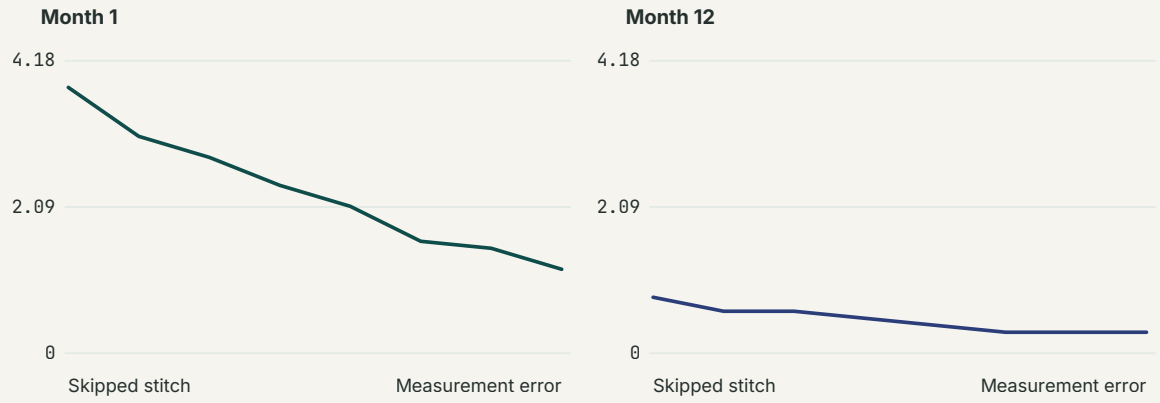
This structure allows a Pareto review to direct engineering attention. The daily huddle examines the leading recurring codes at the affected stations. The weekly review separates immediate containment from corrective action on the cause and preventive action that stops recurrence on another line. A repair to one garment closes a disposition task, not a CAPA. Closure requires evidence that the cause has been removed or controlled across a defined later production population.

> **GFT NOTE**
>
> Start the Quality Log before installing additional cameras. Define the defect taxonomy, inspection boundary, DHU and FPY denominators, severity classes and release authority on paper or in the validated spreadsheet first. Then connect each camera event to that schema. GFT's practical rule is one shared code for one physical defect, with separate fields for human and machine detection. This prevents a digital pilot from creating a second, incompatible version of quality truth.

Exhibit 27, p. 108 shows a constructed defect mix for a greenfield shirt line. It is a planning illustration of how a Quality Log can change as recurring causes are removed, not an observed GFT ramp.

EXHIBIT 27 / DEFECTS PER HUNDRED UNITS

The illustrative defect mix compresses from 18.5 to 3.8 DHU as recurring causes are engineered out



ILLUSTRATIVE [S21] [S37] Fully illustrative GFT quality model. Month 1 values sum to 18.5 DHU: 3.8 skipped stitch + 3.1 broken stitch + 2.8 uneven seam + 2.4 puckering + 2.1 open seam + 1.6 oil stain + 1.5 raw edge + 1.2 measurement error. Month 12 values sum to 3.8 DHU: 0.8 + 0.6 + 0.6 + 0.5 + 0.4 + 0.3 + 0.3 + 0.3 respectively. The trajectory is assumed for method demonstration and is not attributed to S21, S37, TLS, CAPA or vision as a measured outcome.

The exhibit demonstrates why a falling DHU total is not enough to explain improvement. The quality lead should be able to state which codes declined, what physical change produced the decline and whether inspection coverage stayed constant. A change in sampling intensity, product mix or defect definitions can mimic progress. Equally, an initial rise after vision deployment may mean better detection rather than worse production. Interpretation must begin with the denominator and the measurement system before celebrating the trend.

The Quality Log also creates the evidence needed for fair supervision. Operators should not be blamed for a defect cluster caused by incorrect machine timing, off-tolerance cut panels or an ambiguous specification. The station record allows the quality lead to test those causes with the mechanic and industrial engineer. Quality governance then becomes an engineering routine rather than a search for a culpable operator.

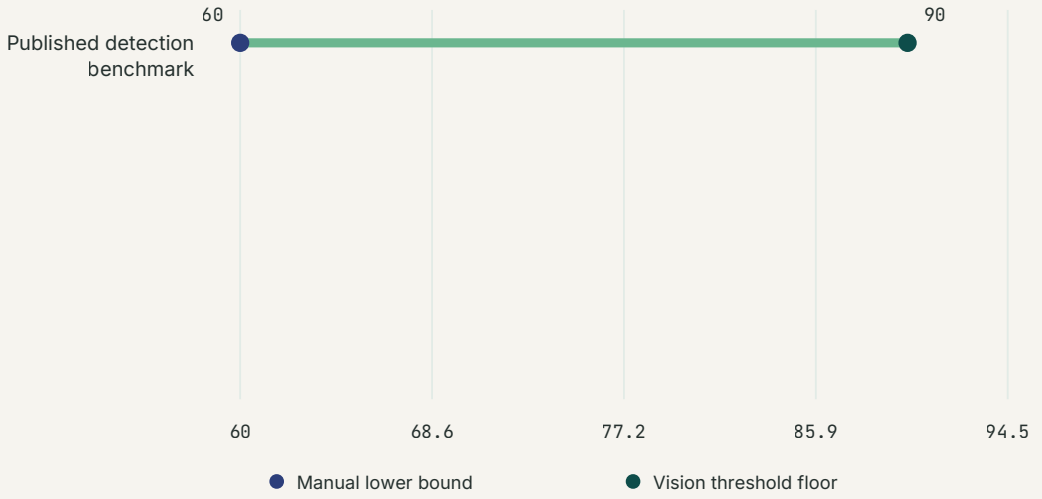
7.4

Edge vision earns deployment through local defect-class evidence

GFT's Digital Strategy ranks computer-vision defect detection as a Tier-1 application because a pre-trained model and camera feed can begin without years of factory sales history. That is a deployment ordering decision, not proof that a general model will recognise local defects. The shared evidence register records vision accuracy above 90 percent across more than 40 fabric and garment defect types and line-scan inspection at up to 60 metres a minute. [R29] **Exhibit 28**, p. 109 places the lower bounds of the published manual and vision benchmarks side by side.

EXHIBIT 28 / PERCENT OF DEFECTS DETECTED

Published benchmarks place manual detection near 60 percent and vision above 90 percent, subject to local validation



SOURCED [R29] [S0702] Sourced benchmark comparison, not a controlled like-for-like trial. Start uses the 60% lower bound of the 60% to 70% manual range in R29, also consistent with the conditional expert result in S0702. End plots 90% as the conservative visual representation of R29's above-90% computer-vision claim. Actual performance varies by defect, fabric, lighting, speed, camera and dataset; this exhibit does not establish GFT operating performance.

The comparison indicates potential, not a commissioning result. R29's reported breadth and speed must be checked against the factory's own fabric construction, colour range, defect sizes and presentation. The older peer-reviewed study is particularly useful as a warning against a single headline accuracy: it found that detection speed and the range of detectable defects were separate challenges, and that individual automatic systems detected specific defect types. [S0702] A supplier demonstration on a familiar dataset cannot answer how the system will treat a new weave, a seed-coat fleck or a faint oil mark in Cameroon.

The quality lead should therefore commission by defect class. A locally adjudicated test set needs confirmed examples of each critical and major defect, difficult defect-free examples, and coverage of intended fabrics and operating conditions. The acceptance review reports recall for each class, false-reject behaviour, precision, inspection coverage and processing latency. Overall accuracy alone can conceal poor detection of a rare but consequential class. Human reviewers must also record disagreement so that the test measures both the model and the clarity of the defect definition.

Camera engineering is part of quality engineering. Lens selection, working distance, illumination, fabric tension, transport speed and image calibration determine what the model can see. The quality lead approves a reference image and lighting check at shift start, while the mechanic or vision technician maintains the mounting, cleaning and electrical protection routine. A model cannot recover a defect that motion blur, glare, lint on the lens or poor fabric presentation has removed from the image.

The commercial context does not remove these tests. DataIntelo's vendor market estimate puts fabric-defect-detection AI at US$523.4 million in 2024 and projects US$6,522.1 million by 2033, equivalent to a stated annual growth rate of 33.8 percent, with Asia-Pacific at about 46 percent of the 2024 market. [R28] Those are market-research estimates and projections, not realised factory savings or independent proof of detection performance. They indicate supplier interest; they are not a reason to bypass a local pilot.

GFT's illustrative edge architecture keeps inference beside the fabric inspection or finishing station. Structured pass, fail and defect-location events enter the Quality Log, while a controlled sample of images supports adjudication and later model improvement. Local processing allows the inspection decision to continue when the central connection is unavailable; events synchronise later with their original event timestamps. Network recovery must not rewrite production history or duplicate alerts.

Deployment proceeds only when human review confirms that the local test meets the approved class-level criteria. Until then, the camera is an additional observation channel, not an automatic release authority. This condition keeps the first digital use case subordinate to product quality and worker judgement.

7.5

Human verification closes the loop between image alerts and process correction

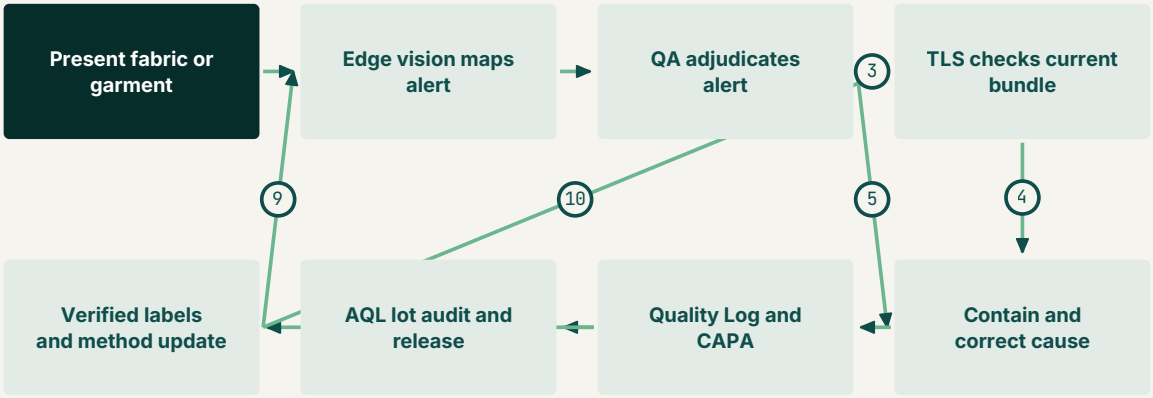
Edge vision changes the quality technician's work from continuous visual scanning towards exception review, measurement and cause verification. It is strongest where the defect is visible on a presented surface and the camera geometry can be controlled. Roving inspectors remain essential for three-dimensional seam assemblies, handle, trim placement, measurement checks and conversations with the operator. The two streams are complementary because they do not observe the same physical boundary in the same way.

At incoming fabric inspection, a line-scan alert identifies a position for the technician to examine. The technician confirms whether the mark is a defect under the specification, records its class and decides whether to cut it out, mark a splice or change the marker plan. At sewing, TLS examines the current bundle and triggers station containment. At finishing, a vision booth can flag visible surface, print, placement or stain issues for human confirmation. Every decision returns to the same Quality Log taxonomy.

Exhibit 29, p. 111 makes that operating sequence explicit. It is a proposed architecture, not a claim that GFT has already implemented it in a factory.

EXHIBIT 29 / DECISION FLOW

Human adjudication joins edge detection, inline containment and final lot release in one quality loop



3. Shared taxonomy
4. Yellow or Red
5. Confirmed defect
9. Controlled model revision
10. Updated inspection method

ILLUSTRATIVE [R29] [S37] [S0701] Illustrative GFT operating architecture. R29 supports the vision-detection component, S37 supports source-level TLS inspection and S0701 supports attribute-based lot acceptance. The complete sequence, feedback path and ownership design are proposed, not sourced as an implemented system or achieved result.

The feedback path needs controls of its own. A model alert is not a verified label until an authorised reviewer confirms or corrects it. Training and test images should be separated by roll, production lot or time period so that near-duplicate views do not create an inflated evaluation. Each model release retains a version identifier, evaluation record and rollback route. New fabrics, colours, lighting setups and defect patterns trigger review rather than silent acceptance of the old model's outputs.

Human adjudication also guards against automation bias. The technician must be able to reject an alert, stop a line despite a clear camera result and escalate an unfamiliar visual pattern. A model's confidence score is not a disposition instruction. For safety-critical defects, the control plan gives the human stop decision priority and requires the defined physical inspection, regardless of whether the camera has been trained on that hazard.

Connectivity failure follows the same principle. Local inference can continue, but the quality lead defines what happens when image storage fills, timestamps drift or synchronisation fails. The station must fail into a known inspection state, not into unobserved production. The quality lead tests these exceptions during commissioning and records them in the operating procedure.

The result is a division of labour in which cameras increase observation coverage and people retain accountability for meaning and release. This is why the quality lead sits between the manual Performance-Management System and the Digital Strategy. The camera produces a candidate signal; the quality system decides whether that signal changes the state of a station, a bundle, a roll or a shipment.

7.6

Final AQL audits verify lots without becoming the production control plan

Acceptance sampling answers a different question from inline control. TLS asks whether a station needs correction now; an AQL audit asks whether a defined lot meets the agreed acceptance criterion. ISO 2859-1:2026 specifies single, double and multiple attribute-sampling plans indexed by Acceptance Quality Limit for lot-by-lot inspection. It applies to a continuing series of lots from one producer and process, with switching rules that can move inspection between normal, tightened and reduced states. [S0701] The standard defines AQL as the worst tolerable quality level and expressly warns that it is not a desirable quality target. [S0701]

A useful final-audit instruction therefore contains more than an AQL number. It names the lot boundary, unit of inspection, defect classes, inspection level, sampling scheme, acceptance and rejection criteria, responsible authority and switching rule. ISO distinguishes a sampling plan from the wider scheme and system that govern how plans change. [S0701] The quality lead must use the applicable standard tables and the buyer's contractual specification to select the plan. Saying only “inspect to AQL” leaves the actual statistical decision undefined.

For GFT's illustrative uniform and ready-to-wear control plan, AQL 1.5 for major defects and AQL 4.0 for minor defects are proposed starting settings, not universal buyer requirements. Critical safety defects carry zero acceptance under that internal policy. The buyer and product specification take precedence, and the quality lead records the selected values against each lot. This chapter does not reproduce sampling tables or prescribe a contractual quality level; those choices require the current standard, product knowledge and agreement with the responsible authority.

Broken-needle control illustrates why severity must override averages. GFT's illustrative protocol requires a locked metal-detection check at packing, a fragment board at every sewing station and replacement only after the operator presents all fragments of a broken needle. If any fragment is missing, the affected bundle is held and searched under the quality lead's instruction. This is a proposed physical control, not a claim that an AQL sample will find a fragment. The ILO sector code separately places machinery safety alongside competence and training for managers, workers and contractors, reinforcing the need to teach these controls rather than post them without practice. [S40]

A failed final audit triggers containment and process review. The lot is held, its disposition is authorised by the designated quality authority, and the failed codes are traced back to stations, materials and inspection streams. The sampling system's

switching logic can then tighten subsequent inspection where quality deteriorates. [S0701] A later pass does not erase the first failure or prove that the root cause has disappeared. CAPA closure still requires production evidence.

GFT's illustrative operating target is for more than 98 percent of internal lot audits to pass on their first presentation. This is a management trigger, not an efficiency claim or a promise to a buyer. Chronic first-pass failures consume packing capacity and threaten dispatch even when every rejected piece can eventually be repaired. Final audit performance therefore belongs beside On Time In Full delivery in the management review, while station-level DHU and FPY explain why the lot succeeded or failed. Contractual product-safety and buyer requirements need specialist confirmation; this operating guidance is not legal advice.

7.7

The quality cohort must be certified on judgement, workload and data integrity

The quality system depends on enough trained people to complete its routes and make independent decisions. For the paper's illustrative 900-person factory, the workforce envelope contains 45 quality staff: 1 QA manager, 4 senior AQL and vision-system leads, 20 inline TLS inspectors and 20 end-of-line or fabric-inspection technicians. This is an illustrative allocation, not a GFT headcount observation. The QA manager owns release authority and buyer alignment. Senior leads own sampling plans, model validation and adjudication. Inline inspectors own source detection, while fabric and finishing technicians own their respective physical boundaries.

Recruitment tests should match the work. Candidates need suitable visual acuity and colour discrimination for the intended fabrics, basic numeracy for DHU and FPY, and spreadsheet literacy for traceable records. Practical selection can ask candidates to classify physical defect samples, measure seams and complete a short Quality Log without invented entries. A written defect-recognition score alone is insufficient because the role also requires calm authority at a workstation and disciplined escalation when production pressure rises.

GFT's illustrative eight-week certification begins with product construction, measurement and the shared defect taxonomy. The register's vision benchmark spans more than 40 defect types, giving a broad reference point for the taxonomy rather than a guaranteed local detection list. [R29] Early modules cover fabric inspection and four-point grading as internal curriculum subjects, followed by sewing defects, TLS sampling and card decisions. Later modules cover Quality Log validation, CAPA evidence, AQL plan administration, camera alerts, lighting checks and broken-needle response. Every module ends in a practical demonstration.

Certification requires the trainee to contain a planted Red-card event, reconcile defects to affected units, adjudicate ambiguous camera alerts and explain when a lot cannot be released. The assessor also plants a data conflict, such as a bundle identifier that does not match the station record. The trainee must stop and resolve the

identity gap rather than complete a tidy but false form. Senior certification adds sampling-plan selection under supervision, confusion-matrix review and approval of a model rollback. Attendance alone earns no sign-off.

The patrol route needs a separate workload proof. Fibre2Fashion's example assigns one checker to 15 or 20 workstations with hourly or two-hourly checks. [S37] Under GFT's illustrative seven-piece, four-round protocol, a 20-station route generates 20 × 4 × 7 = 560 inspected pieces per inspector per shift. At an assumed 30 seconds per piece, inspection alone consumes 280 minutes, before walking, recording, coaching or containment. This arithmetic is illustrative and must be replaced by observed task times.

On a 32-station line, the same illustrative assumptions generate 32 × 4 × 7 = 896 pieces, or 448 inspection minutes at 30 seconds each. That leaves too little of an eight-hour shift for patrol movement and corrective work once breaks and huddles are included. [R16] The nominal allocation of one inline inspector per line cannot therefore be accepted without a route study. The quality lead may stagger station groups, reallocate technicians during style changes, adjust sampling on evidence or seek additional coverage. Headcount follows the control workload, not the convenience of the organogram.

Cross-training reduces conflict between production and quality. Line supervisors learn the same defect codes, sample rules and containment boundaries as inspectors, while quality technicians learn line balance and maintenance basics so that they can distinguish a method problem from a machine problem. The ILO code's treatment of competence and training supports qualification for the actual role rather than reliance on informal exposure. [S40] Senior quality leads then certify others only after their own decisions have been audited for consistency.

The final governance test is independence under pressure. A quality technician must be able to hold a Red status, challenge an unverified model and stop a shipment without waiting for production approval. The plant manager resolves competing priorities through the documented quality authority, not by asking the inspector to relax a rule after the fact. This makes the quality lead the custodian of the whole bridge: early human detection at the needle, wider machine observation at suitable surfaces, clean records, verified causes and defensible lot release.

A defect becomes expensive when it travels; quality leadership shortens the distance between detection and correction.

CHAPTER SOURCE NOTES

R29 MDPI; industry inspection literature. Publication date unrecorded; inherited source-text check.

S37 Fibre2Fashion. 2013.

S0702 Hindawi Publishing Corporation, EURASIP Journal on Advances in Signal Processing. 2008.

S21 International Labour Organization (ILO). 2024.

R16 WageIndicator. Publication date unrecorded; inherited source-text check.

S0701 International Organization for Standardization (ISO). 2026-01.

R28 DataIntelo. Publication date unrecorded; inherited source-text check.

S40 International Labour Organization (ILO). 2022.

08

Cameroon's Fragmented TVET System Requires Factory-Anchored Qualification Bridges

Cameroon's vocational institutions operate under different mandates, so a garment manufacturer must translate national credentials into measured factory competence through a formal qualification bridge.

CHAPTER 08
DECISION TEST

Cameroon's vocational institutions operate under different mandates, so a garment manufacturer must translate national credentials into measured factory competence through a formal qualification bridge.

A Cameroonian garment factory should not wait for a single national TVET system to produce job-ready supervisors and technicians. It should build a qualification bridge: partner institutions teach foundations, the factory defines and assesses production tasks, instructors practise on industrial equipment, and regulators recognise portable credentials where the applicable route permits. This is a response to institutional design, not a complaint about individual graduates. MINESEC, MINESUP and MINEFOP operate separate education and certification arrangements with limited coordination. [S42] The often-cited 12.5 percent education-budget share also combines higher education with vocational training, so it cannot be read as a standalone TVET allocation. [S42] The practical answer is a governed interface between these pathways and the sewing floor, with task standards, assessment evidence and funding conditions made explicit before recruitment begins.

8.1

Governance split across MINESEC, MINESUP and MINEFOP fragments industrial standards

The three ministerial pathways are not interchangeable labels for the same provision. MINESEC supervises technical secondary education, MINESUP covers higher technical and technological credentials, and MINEFOP delivers vocational training while coordinating skills development. The ILO reports that these ministries operate separately, with little coordination of measures and regulations. It also records no common platform bringing all relevant ministries together to define assessment, certification and accreditation standards. [S42] Fragmentation therefore affects the meaning of a qualification, not merely the organisation chart.

The institutional counts show the breadth of the interface a factory would face. In 2015/2016, Cameroon had 729 public and 69 private technical and vocational secondary institutions. Public TVSE enrolment was 343,597 pupils, including 34.2 percent girls, against 1,238,891 pupils in public general secondary education. In 2017, 226 private higher education institutes and 41 technological and vocational education institutions taught technology, engineering, health and other professions. [S42] These dated counts describe capacity at different levels; they do not measure garment relevance, current equipment condition or the number of work-ready technicians.

MINEFOP adds another distinct pathway through vocational training centres and related structures. More than 1,600 public and private structures provided vocational training to nearly 46,000 students in 2017, with 87 percent of the structures privately operated. Subjects included electrical and mechanical engineering as well as information technology and timber. [S42] This is a potential feeder system for industrial maintenance and work study. It is not evidence that those centres teach sewing-line balancing, industrial overlock timing or hourly production control.

8.2 EACH MINISTRY RECORDS A DIFFERENT KIND OF COMPLETION

A school can record enrolment, a university can record a credential and a vocational centre can record course completion without any of them observing performance at a paced workstation. That distinction matters when a factory recruits for four different roles. A line supervisor must coordinate people and flow. An industrial-engineering

technician must measure work content. A mechanic must diagnose a machine safely. A quality lead must classify defects and preserve inspection records. One generic label such as “textile graduate” cannot certify these separate abilities.

The factory should therefore recruit by evidence of component capability rather than by institutional prestige. A credential remains useful: it can indicate theoretical preparation, persistence and a recognised education pathway. The bridge adds the missing production boundary. It asks what the candidate can do, on which machine or information record, under what time and safety conditions, and with what degree of supervision. This approach also makes partner selection more disciplined. A partner is chosen for a defined contribution to the pathway, not asked to supply every competence.

8.3 A SHARED ROLE DICTIONARY CREATES A COMMON BOUNDARY

GFT's proposed interface starts with a role dictionary agreed by the factory and its education partners. Each role is decomposed into tasks, prerequisite knowledge, observable evidence and failure conditions. For example, mechanical safety is not absorbed into an average score, and a supervisor's written description of line balancing cannot substitute for rebalancing a disrupted line. The dictionary becomes the common reference for school lesson plans, factory practicals, assessor checklists and subsequent skill-matrix entries.

This does not replace national standards or confer authority the factory does not possess. The World Bank identifies weak occupational standards, qualification frameworks and industry collaboration as constraints in Cameroon's skills system. [S18] A factory dictionary is an employer's controlled translation layer. Where a national occupational standard exists, the factory maps to it. Where recognition is sought, the competent institution must approve the relevant package and assessment route. The bridge is strongest when this distinction is documented rather than blurred.

8.4

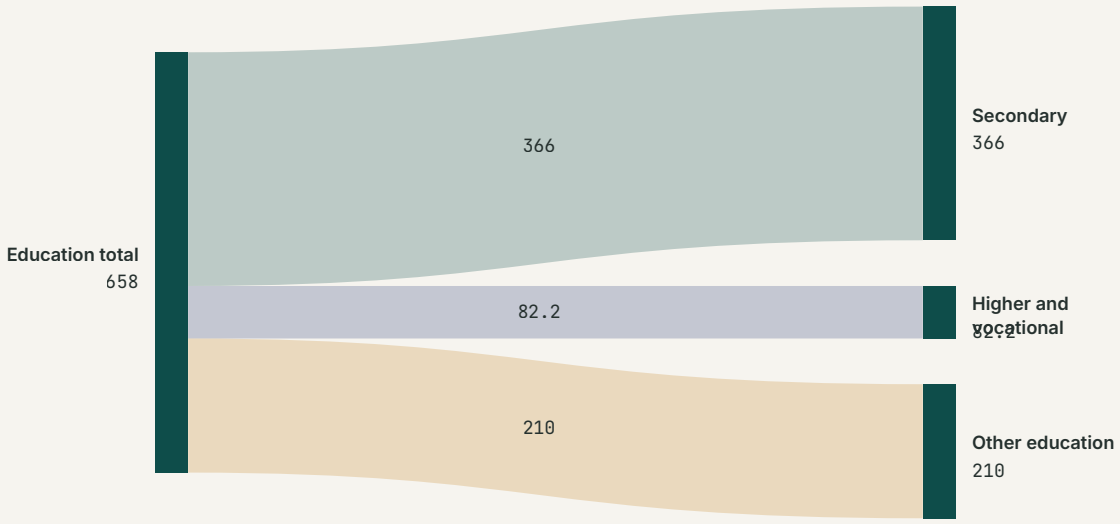
Public underfunding and equipment deficits leave TVET graduates unprepared for factory lines

The funding evidence requires care. In 2018, public expenditure on education and training was XAF 657.9 billion, equivalent to 15.8 percent of the national budget. Secondary education received 55.6 percent, while higher education and vocational training together received 12.5 percent. [S42] Applying those reported shares to the reported total gives XAF 365.8 billion for secondary education and XAF 82.2 billion for the combined higher-education and vocational-training category, with the remaining XAF 209.9 billion outside those two categories. These are GFT arithmetic from rounded shares, not separately published allocations.

Exhibit 30, p. 119 preserves that combined category. It also prevents a common analytical error: treating the whole XAF 82.2 billion as money available to vocational institutions. The source does not provide the split between higher education and vocational training, and its figures describe 2018 rather than the current budget. [S42]

EXHIBIT 30 / XAF BILLION, DERIVED FROM ROUNDED REPORTED SHARES

The 2018 education allocation combined higher and vocational education in one small reported share



DERIVED [S42] Derived from the 2018 total of XAF 657.9 billion: secondary = 657.9 × 55.6 percent = 365.8; higher education and vocational training combined = 657.9 × 12.5 percent = 82.2; remainder = 657.9 - 365.8 - 82.2 = 209.9. Values are rounded to one decimal and reconcile to the total. The source does not separate higher education from vocational training.

Participation figures reinforce the need to look beyond the budget total. Only 23.9 percent of secondary students were in technical and vocational education in 2016. Higher-education gross enrolment was 19.2 percent, with a lower rate for women at 16.9 percent than for men at 21.4 percent. [S42] These observations describe access, not learning quality. They nevertheless caution against assuming that a large, technically trained applicant pool will appear automatically in every recruiting location.

The more direct warning comes from employers. In the 2015 employer survey cited by the World Bank, only 42 percent reported full satisfaction with the competencies of staff holding TVET qualifications. Dissatisfaction was particularly acute in agriculture, wood, construction and cotton/textile industries. The appraisal links weak relevance to limited employer involvement, few practical placements, poor materials and infrastructure, and instructors with limited industry exposure. [S18] This is stronger evidence for a factory bridge than the budget share alone because it concerns the competence of graduates at work.

8.5 EQUIPMENT CHANGES THE SKILL THAT PRACTICE CAN PRODUCE

Global TVET analysis reaches a similar operational conclusion: learners are poorly served by under-prepared teachers and outdated equipment, while providers can focus on what they know how to teach rather than what firms need. [S15] A Cameroon-focused systematic review also reports low practical skills, limited confidence, obsolete workshop equipment and weak industry involvement in curricula. [S16] The consequence is specific. Classroom explanation of stitch formation cannot establish whether a learner can set a machine, detect a fault and verify a safe repair under production conditions.

Practice on unsuitable equipment can even conceal the gap. A learner may understand a domestic machine yet have no experience of industrial speed, guarding, attachments, thread paths or line-side response. The answer is not to discard theoretical instruction. It is to sequence it toward an observed industrial task. Safety and machine competence belong in that sequence: the ILO code addresses sewing-machine safety, ergonomic hazards, and the competence and training of managers, supervisors and workers. [S40]

A factory should audit partner equipment by task rather than count machines. The audit records model, guarding condition, available attachments, power requirements, learner access time and the role task each machine can support. It also records what cannot be taught safely. Equipment donation without instructor practice, service support and assessment time would leave the same bottleneck in a newer room.

8.6

ONEFOP skills anticipation and social dialogue miss garment shop-floor roles

Cameroon has institutions for anticipating skills demand and discussing training with employers. MINEFOP's National Observatory for Employment and Vocational Training, ONEFOP, is the main body responsible for skills anticipation. The ILO also describes an inter-ministerial committee extended to private-sector and civil-society participants, chaired by the Prime Minister and meeting twice a year, alongside partnership agreements involving MINEFOP, MINESUP and employer organisations. [S42] These mechanisms provide a route for engagement. Their existence does not mean that a garment factory's role-level demand has already been captured.

The ILO finds that ONEFOP does not yet have an efficient mechanism to identify and anticipate future skills demand and related occupations. It cites weak coordination capacity, while employer organisations and trade unions play a limited role in policy definition and governance. [S42] A national or sectoral discussion can therefore agree that “textile skills” matter without resolving how many people can balance a line, repair an overlock or conduct a statistically valid final inspection.

8.7 SECTOR LABELS ARE TOO COARSE FOR A TRAINING PURCHASE

A usable demand signal begins below the sector label. “Cotton textile” contains fibre processing, spinning, weaving, dyeing, cutting, sewing, finishing and distribution. Each has different equipment and failure modes. Even within garment assembly, an experienced sewing operator is not automatically a supervisor, and an automotive mechanic does not automatically understand stitch-forming mechanisms. Training procurement based on a broad sector name risks buying accessible courses rather than scarce capability.

The factory's demand schedule should therefore state role, task, headcount need, required proficiency and date of independent performance. It should distinguish entry operators from the smaller leadership and technical cohort. It should also state the work context: machine family, product range, shift arrangement, language of instruction and production-data records. This is the level at which a provider can design practice and an assessor can make a defensible judgement.

A quarterly role-and-task review is sufficient for the proposed bridge. The factory brings vacancy forecasts, skill-matrix gaps, downtime causes, quality escapes and supervisor readiness. Providers bring enrolment, instructor availability, assessment results and completion constraints. Employer and worker representatives can test whether the pathway is accessible and whether assessment is fair. The meeting's output is not a general communiqué. It is a revised task standard, a named instructor action and a dated decision on the next cohort.

8.8 GRADUATE TRACING MUST RETURN TO THE CURRICULUM

ONEFOP's national function cannot substitute for factory-level learning. The bridge needs a feedback record linking each graduate's assessment profile to later probation evidence. If graduates repeatedly fail the same machine-safety check, the partner reviews the relevant practical sequence. If they pass a written balancing exercise but cannot respond to an absence shock, the factory changes the simulation and instructor preparation. The purpose is not to rank schools publicly. It is to locate the exact instructional boundary where performance changes.

This feedback must protect people as well as production. Individual records should be access-controlled, used for development and retained under an agreed policy. Cohort-level patterns are usually sufficient for curriculum review. A portable credential should record demonstrated competence, not a manager's subjective impression of attitude. Such discipline makes the employer's demand signal more credible when it is later shared with MINEFOP, MINESUP or sector bodies.

8.9

Law No. 2018/010 and Competency-Based Training create an opening for dual apprenticeship

Cameroon has a legal and pedagogical opening for this bridge. The ILO records that Law No. 2018/010 of 18 July 2018 recognises apprenticeships as a form of vocational training, while noting that organising guidelines still had to be defined in its report. [S42] The observation date matters. A sponsor should obtain current regulatory advice before treating a particular factory arrangement as accredited, funded or legally sufficient. This chapter is an operating design, not legal advice.

Competency-based approaches also provide a common instructional logic. The ILO records their introduction in primary education under MINEDUB in 2007 and secondary education under MINESEC in 2014, with further TVET restructuring through PARETFOP. [S42] The World Bank's PADESCE appraisal places industry representatives inside the development of CBT packages. Skills needs, task levels, occupations and projected human-resource needs are assessed before curricula are developed, validated with industry and approved by the respective ministries. [S18]

8.10 WORK-BASED LEARNING NEEDS TWO COORDINATED ASSESSMENTS

The appraisal describes a dual-apprenticeship model combining college-based theoretical training at 20 percent with workplace-based practical training at 80 percent, typically under a company apprenticeship contract. It also records that MINEFOP was

still working out details and legal requirements at appraisal. [S18] GFT treats this as a design precedent, not a compulsory ratio or proof that every garment programme can now use the same contractual form.

Under the proposed bridge, the partner assesses foundations: measurement, basic electricity, materials, technical communication and safe conduct. The factory assesses production execution: machine setup, task completion, quality verification, record accuracy and response to a controlled disruption. Both assessments refer to the same role dictionary. A learner should not face one definition of competence in class and a contradictory one at probation.

Dual assessment also protects against two failure modes. School-only assessment can reward recall without production readiness. Factory-only assessment can reward immediate output while neglecting safety, worker rights and transferable understanding. The bridge requires both. The ILO textile code reinforces the need for competence, training and machine safeguards rather than output alone. [S40]

8.11 APPRENTICESHIP DOCUMENTS MUST MAKE RESPONSIBILITY VISIBLE

Each apprenticeship file should identify the learner, provider, factory tutor, role standard, training locations, supervision arrangements, assessment evidence and status of any recognised credential. It should state who may authorise machine operation and who may suspend it on safety grounds. It should separate training time from productive assignment where the applicable arrangement requires that distinction. These are practical controls for review by the competent advisers and institutions, not a substitute for them.

The factory tutor's workload must be planned. A tutor who is simultaneously accountable for hourly output and unstructured teaching will usually sacrifice the teaching. The bridge therefore assigns specific observation windows, standard demonstrations and sign-off duties. Partner instructors receive corresponding factory exposure so that their classroom examples use current tasks and records rather than an imagined production line.

8.12

PADESCE can co-finance a verified bridge, not an assumed subsidy

PADESCE supplies a demand-driven financing mechanism that fits parts of this design. As of 20 August 2026, MINEFOP reported nearly 3,000 training vouchers issued through the Competitive Skills Development Mechanism. It also reported support for on-the-job training, staff development in small and medium-sized enterprises, and skills development in the social and informal economy. [S17] These are reported programme activities, not a commitment to finance a particular garment project.

The same ministry update shows why applicants must distinguish achievement from intention. It reports reforms under way during 2025/2026, nearly 10,000 registered candidates for vocational-qualification examinations whose final statistical assessment was not yet complete, and proposals for a Vocational Training Development

Fund and Sector Skills Councils. [S17] Registered candidates are not completions, proposed funds are not available appropriations, and planned councils are not evidence that sector governance has already changed.

8.13 THE FUNDING APPLICATION BEGINS WITH ELIGIBLE TASKS AND EVIDENCE

A factory should build its funding file around the same role dictionary used for delivery. The file identifies the applicant cohort, provider, tasks, practical facilities, instructor preparation, assessment method, completion evidence and post-training destination. It separates partner-school costs, factory instruction, consumables, assessment and any learner support. This makes each proposed cost traceable to a training activity rather than presenting one undifferentiated pre-production invoice.

The PADESCE appraisal gives a further reason for this structure. Its competitive skills development fund was designed to support demand-led training benefiting employers, providers, trainees and employees, with attention to women and young people from underserved areas. Its CBT arrangements link funding to packages developed, approved and in use, and to instructors trained in those packages. [S18] The financial logic therefore depends on demonstrable relevance and implementation, not simply on an employer's intention to hire.

Four questions should gate any application. Is the applicant eligible under the current call? Is the proposed provider and package eligible? Which costs can be financed, and under what procurement and evidence rules? What result must be achieved before disbursement? Until the competent programme authority answers these questions in writing, the factory model should record public co-financing as unconfirmed. No subsidy should be netted against the base training budget merely because vouchers exist elsewhere.

8.14 PUBLIC MONEY SHOULD ADD ASSESSMENT CAPACITY, NOT HIDE RECURRING COST

The strongest use of competitive funding is to create durable joint capability: instructor practicums, approved task packages, assessor training, safe practical equipment and independent assessment. These are difficult for one small factory or school to finance alone, and they benefit later cohorts. Routine production cost should not be relabelled as training to fit a call. Nor should a factory make its entire supervisor pipeline dependent on a short project window.

The base case therefore funds the minimum bridge from the venture's own pre-production budget. A confirmed award can widen access, improve facilities or strengthen assessment within its approved purpose. This treatment keeps the launch decision honest. It also creates a clean comparison between the factory-funded core and any publicly financed addition, allowing the partners to evaluate what changed rather than claiming that total expenditure caused total outcomes.

8.15

Recognition of Prior Learning can fast-track informal tailors and mechanics without lowering the gate

The informal economy is not an empty skills pool. Among employed informal-sector workers in the ILO's cited national evidence, 66.9 percent learned a trade on their own or through hands-on practice, 24.4 percent learned in small businesses, and only 5.3 percent learned in a TVET establishment. [S42] A recruitment process restricted to formal diplomas would therefore exclude many people with relevant manual experience. It would also mistake the route by which a skill was acquired for the skill itself.

MINEFOP's RPL mechanism offers one response. The ILO describes it as functional and recognised by businesses, with successful candidates obtaining credentials including the vocational qualification credential, DQP, or specialised technician credential, DTS, depending on the course. [S42] Historical uptake was nevertheless very small: in 2016, only 17 candidates were assessed across office and secretarial skills, electrical engineering and automotive repair, of whom 9 passed. [S42] That old result is evidence of limited reach in those fields and that session, not a current national pass rate.

Recent progress also needs an exact boundary. In August 2026, the ILO reported validated technical tools for a sector-specific RPL framework in building and construction. Regulatory adoption, assessment pilots, assessor preparation and resource mobilisation still remained before certification could become operational. [S19] This is a constructive precedent for recognising informal learning. It is not evidence of an operational garment RPL pathway, and it should not be cited as one.

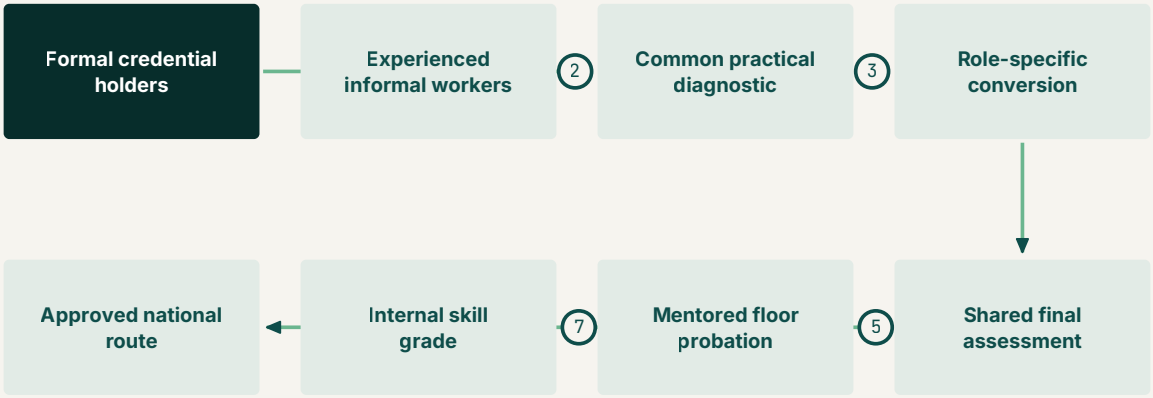
8.16 INTERNAL SCREENING IS NOT NATIONAL RECOGNITION

GFT's bridge uses two entry streams. Formal candidates present their credentials and complete the same practical diagnostic. Informal candidates present evidence of experience and complete a structured practical screen. Both then enter role-specific conversion learning and a common final assessment. The factory may sponsor an available national assessment where the candidate and occupation qualify, but its internal skill grade never masquerades as a DQP, DTS, BTS or DUT.

Exhibit 31, p. 125 shows the proposed sequence. It is a process design, not a measured cohort funnel. The informal-learning percentages above describe the national evidence base; they do not predict the share of applicants who will pass. [S42]

EXHIBIT 31 / PROPOSED QUALIFICATION PROCESS

Formal and informal entry routes converge on the same observed factory competence



2. Experience screen
3. Individual gaps
5. Critical gates passed
7. Only where eligible

ILLUSTRATIVE [S19] [S42] Illustrative GFT bridge design. Formal credentials and informal experience are different entry evidence, not different final standards. Internal screening is not national RPL. Any recognised credential depends on an approved route, eligible candidate and competent authority. No throughput or pass rate is claimed.

For operators, an illustrative two-day factory screen can test fabric handling, stitch control, measurement, defect recognition and safe machine conduct. For mechanics, it can test observation, isolation, diagnosis and reassembly on a controlled training head. These are employer diagnostics. A candidate with strong partial evidence enters a shortened conversion module; a candidate with unsafe practice receives foundation instruction rather than accelerated placement. The screening basis and proposed duration are illustrative design choices, not national requirements.

Acceleration must never remove the critical gates. An informal tailor may complete a whole garment skilfully yet need conversion to repeat one specified operation to a common quality standard. A roadside mechanic may diagnose by sound yet need formal isolation, measurement and verification routines. The bridge values existing dexterity while making missing industrial disciplines visible. That is faster than starting everyone from zero and safer than assuming experience transfers without instruction.

WORKED EXAMPLE: A HIGH TOTAL CANNOT COMPENSATE FOR A CRITICAL FAILURE

An illustrative practical assessment contains five tasks worth 20 points each. One candidate scores 18, 17, 18, 20 and 11, giving 84 out of 100. The final task is machine safety, for which the illustrative critical minimum is 14. The candidate therefore does not pass despite the high aggregate. A second candidate scores 15, 15, 15, 16 and 15, giving 76 out of 100, and passes only if every other critical gate is also met. The arithmetic shows why the bridge uses threshold rules alongside scores. These values and thresholds demonstrate the assessment method; they are not observed results or a national grading scheme.

8.17

A tripartite Factory-TVET Qualification Bridge turns policy openings into floor readiness

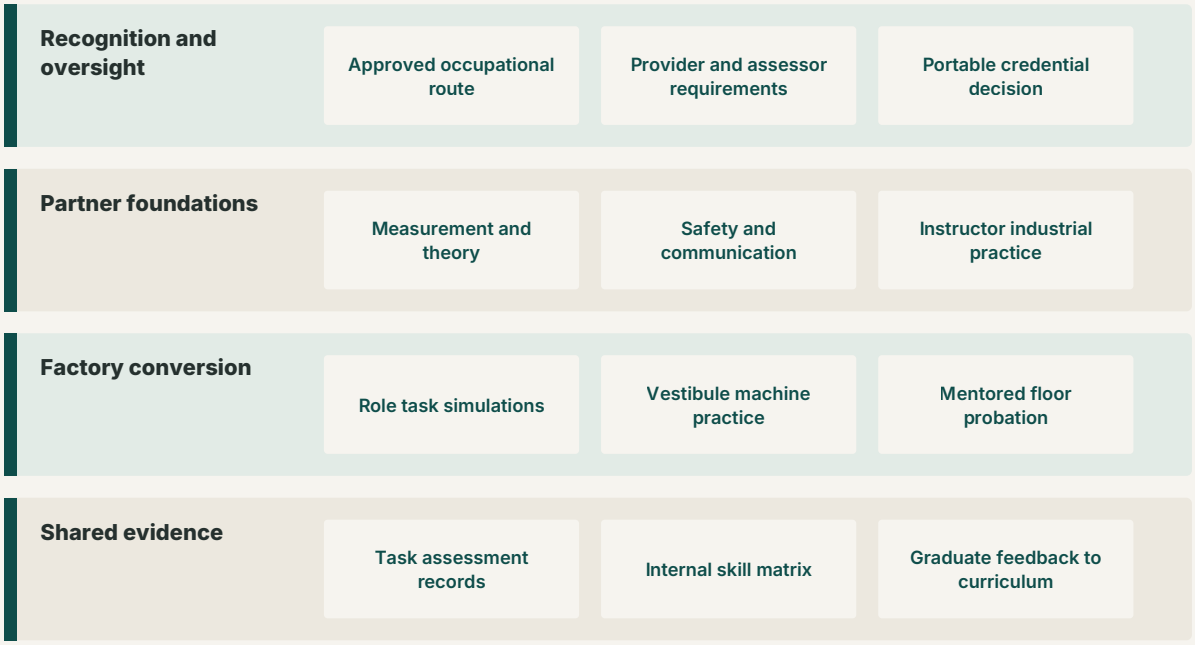
GFT's proposed bridge joins two local MINEFOP vocational centres or Centres of Vocational Excellence with one MINESUP technological institution and the factory training function. The number and type of partners are illustrative planning choices, not existing GFT partnerships. Two vocational partners provide route diversity and practical capacity; the technological institution supports higher-level work study, electrical and measurement foundations. Final selection depends on a task and equipment audit, instructor commitment and the applicable approval route.

The partner institutions would deliver an illustrative eight-week foundation block covering technical measurement, basic electricity, materials, shop-floor terminology, spreadsheets and safety. The factory would then deliver role-specific vestibule practice and mentored floor probation. Partner instructors would complete time-bound industrial practicums, with the outline's 15-to-20-day window treated as an illustrative planning range rather than a PADESCE entitlement. A 90-day probation period is likewise a proposed factory gate, not a nationally prescribed duration. The underlying CBT principle is sourced: define industry tasks with employers, develop the package, validate it and train instructors before use. [S18]

Exhibit 32, p. 127 separates responsibilities. National bodies and recognised providers retain their authority over approved qualifications. The factory controls its internal standard and employment decision. The shared evidence layer allows these responsibilities to connect without one party silently assuming the powers of another.

EXHIBIT 32 / PROPOSED INSTITUTIONAL RESPONSIBILITIES

A qualification bridge joins national recognition to factory evidence without merging their authority



ILLUSTRATIVE [S18] [S40] [S42] Illustrative GFT architecture informed by documented CBT, competence and governance arrangements. It does not assert that accreditation, partnerships or national garment RPL already exist. Recognition routes require current confirmation by the competent institutions.

The architecture becomes operational only when each role has a distinct practical gate. A common “industrial garment certificate” would be too blunt. The supervisor must coordinate a disruption and communicate the response. The industrial-engineering technician must establish and use work measurements. The mechanic must complete a safe diagnosis and verify the repair. The quality lead must classify evidence and preserve a reliable inspection record. **Exhibit 33**, p. 128 summarises the proposed mapping.

EXHIBIT 33 / PROPOSED ROLE AND CREDENTIAL MAP

Each leadership role needs different entry evidence and a distinct practical gate

Factory role	Entry evidence	Factory practical proof	Portable route
Line supervisor	DQP, DTS, BTS, DUT or experience screen	Rebalance a disruption and lead the review	Approved occupational assessment where available
IE technician	Technical DTS, BTS or DUT	Measure work and produce a feasible balance	Relevant recognised technical pathway
Machine mechanic	Mechanical or electrical credential, or experience screen	Isolate, diagnose, repair and verify safely	Approved centre or RPL assessment where eligible
Quality lead	Technical credential or equivalent diagnostic	Classify defects and validate the inspection record	Approved provider assessment where available

ILLUSTRATIVE [S16] [S18] [S19] [S40] [S42] Illustrative GFT design, not an accredited curriculum or a statement of automatic credential eligibility. Entry examples draw on documented Cameroon credential routes. The factory proof is an internal employment gate. A portable award requires an approved provider, occupation, assessment and candidate route.

> **GFT NOTE**
>
> Authorise the bridge only after three artefacts are complete: a role-standard annex signed by every delivery partner, an instructor-and-assessor practicum plan, and a responsibility matrix for learner records, internal grades and any external credential. Fund the minimum viable bridge in the pre-production base case. Treat public co-financing and national recognition as gated enhancements until written confirmation establishes eligibility, scope and conditions.

8.18 INSTRUCTOR PRACTICE IS THE FIRST PRODUCTION INVESTMENT

Instructor development should precede the learner cohort. The factory supplies controlled machine tasks, current role standards and real examples of downtime or quality records with sensitive information removed. Partner instructors practise the task, teach it back and are assessed on their demonstrations. The factory tutors, in turn, learn the provider's sequencing and assessment methods. This reciprocal arrangement addresses the industry-exposure weakness documented in both global and Cameroonian evidence. [S15] [S16]

The practicum ends with teachable assets, not attendance certificates. Each instructor leaves with a task breakdown, safety briefing, demonstration sequence, common-error guide and assessment checklist. Each asset identifies the equipment and conditions under which it is valid. When a machine, product or control record changes, the role owner reviews the affected asset. This keeps the curriculum coupled to production without making it dependent on one expert's memory.

8.19 COHORT REVIEW MUST TEST COMPETENCE, ACCESS AND PORTABILITY

A bridge review examines more than completion. It checks attendance and withdrawal reasons, practical first-pass results, critical-gate failures, probation performance, instructor observations and graduate destinations. It compares formal and informal entry routes only after accounting for their starting diagnostic profiles. It also reviews whether women and candidates from underserved areas can participate in practice and assessment, reflecting the access concerns in the programme evidence. [S18]

The review has three possible decisions. Continue an effective module, revise a module whose evidence reveals a defined gap, or stop a pathway that cannot deliver safe and transferable competence. Expansion follows only after assessors apply the standard consistently and graduates perform under mentored floor conditions. A signed memorandum is not a success measure, and neither is the number of people enrolled.

The final safeguard is honesty about recognition. Internal grades help the factory deploy people and plan further training. National credentials can provide wider portability when an approved route exists. The bridge should pursue both, but never promise the second before eligibility and assessment arrangements are confirmed. This protects the learner, the employer and the credibility of the qualification system.

A credential can cross institutions; competence must still be proven at the point of work.

CHAPTER SOURCE NOTES

S42 International Labour Organization (ILO). 2020.

S18 World Bank (International Development Association). 2020-07.

S15 UNESCO, World Bank and International Labour Organization. 2023-07-13.

S16 North American Academic Research (TWASP). 2024-12-22.

S40 International Labour Organization (ILO). 2022.

S17 Cameroon Ministry of Employment and Vocational Training (MINEFOP / JEME). 2026-08-20.

S19 International Labour Organization (ILO). 2026-08-04.

09

BUILDING THE PIPELINE / LOCATION CHANGES THE WORKFORCE PLAN

Siting Between the Douala Corridor and the Garoua Cotton Belt Reshapes Talent Sourcing

A sponsor should select the location that can sustain the required shift at an evidenced total workforce cost. Cotton proximity, recruitment depth and relocation needs must be tested separately.

CHAPTER 09
DECISION TEST

A sponsor should select the location that can sustain the required shift at an evidenced total workforce cost. Cotton proximity, recruitment depth and relocation needs must be tested separately.

The siting decision should remain conditional until the sponsor has tested recruitment and retention at both candidate locations. A factory on the Douala-Dibamba corridor should test the hypothesis that technical recruitment is easier there. A factory in Garoua should test how cotton-sector experience converts into garment capability, and how much specialist relocation is required. Neither proposition is an established labour-market result. GFT recommends comparing accepted employment offers, demonstrated skills and the cost of sustaining a qualified shift, then carrying the unresolved assumptions into the investment decision. This chapter provides that comparison method; it does not announce a site, an operating factory or a training partnership.

9.1

The sponsor must compare complete operating systems before selecting a site

The inherited evidence register describes a substantial cotton economy and an industrial processing ambition. It records more than 220,000 producers supported by SODECOTON and nine ginning plants, alongside approximately 5 percent local cotton-fibre processing and a national target of 50 percent by 2030. These are inherited sector statements, with original publication dates unrecorded in the register. They explain why local processing merits investigation, but establish neither a labour supply contract nor garment-ready skills at a particular address. [R03] [R06] [R07]

The geographical choice should begin with the proposed process boundary. A cut-make-trim factory buys fabric and turns it into garments. Cotton near its gate does not replace the fabric specification, processing capability or delivery agreement it needs. An integrated mill has a different input boundary and a different technical staffing plan. GFT recommends fixing the process route before scoring locations, so the sponsor does not credit a garment assembly site with an upstream advantage that its actual purchasing model cannot use.

The same discipline applies to port proximity and electricity. Commission site-specific freight quotations, incoming-machine delivery plans and power-quality measurements. Record the origin, destination, service boundary and recovery arrangements. Treat a presumed corridor advantage as a question to test. A city name does not certify the connection serving a parcel, the availability of a maintenance contractor or the arrival time of a replacement component. The staffing consequences should follow the measured operating risks, including the capability needed to recover from interruptions.

Use a common staffing specification in both locations. Define the production calendar, machine family, product complexity, required supervisory coverage and quality responsibilities. Specify the practical task that proves each role. Ask recruiters to price that same specification, rather than accepting incompatible job titles as equivalents. A technician able to install office computers cannot automatically diagnose a sewing-machine control fault; an experienced tailor cannot automatically rebalance a production line. These distinctions are proposed assessment requirements, not findings about individual candidates.

Document the dependency between people and equipment at each proposed parcel. A specialist who can restore a control board is useful only if the necessary test equipment, replacement part and authorisation are available. Ask the technical lead to trace a representative failure from notification to safe restart, naming the local action and the external dependency. Price that recovery arrangement alongside the specialist offer. This makes a proposed location advantage inspectable without assuming that nearby industrial activity automatically supplies every service the factory needs.

The anchor figures in **Exhibit 34**, p. 132 retain their different evidential boundaries. The employment numbers are announced project plans from the inherited register, not observed recruitment outcomes. The register flags later source refreshes but does not supply original publication dates for these entries. They should therefore enter a demand scenario, not a count of available workers or completed jobs. [R10]

EXHIBIT 34 / INHERITED SECTOR AND PROJECT FIGURES

Cotton activity and announced jobs describe different planning boundaries

>220,000	9
SODECOTON producers	**SODECOTON gins**
Inherited network description	Inherited network description
12,000	3,000
Dibamba planned jobs	**Garoua planned jobs**
Camtext SA announcement	Camtext SA announcement

SOURCED [R03] [R10] Original publication dates were not recorded in the inherited register. Producer and gin counts describe SODECOTON's reported network, not a labour pool. Camtext SA job counts are announced plans, not realised employment or available candidates.

No single anchor resolves the location decision. GFT recommends separating evidence about inputs, demand and capability before constructing a score. A sponsor should be able to reject an attractive site if it cannot staff its minimum safe operating

configuration. Equally, a proposed relocation programme should remain an option where its cost and candidate acceptance can be demonstrated. A weighted average must not conceal an unfilled critical role.

9.2

Northern textile experience needs an industrial conversion test

Garoua has a specific training example that can be discussed without inventing a programme affiliation. Reporting dated 3 September 2026 describes Gaaraadji in the Poumpoumre neighbourhood, teaching weaving, dyeing and embroidery. It also describes formal vocational courses as planned for October, rather than documenting their commencement. This is evidence of a local initiative and its reported activity, not evidence of a supply agreement, industrial qualification or GFT partnership. [S0902]

The article's monthly training-fee example refers to a participant's earlier seamstress training. Her subsequent course at Gaaraadji is described as free. The earlier fee should not become an assumed centre tariff or a regional willingness-to-work measure. Nor should a craft-training account establish factory retention, machine-specific competence or the availability of supervisors. Those would require different observations, taken at the relevant recruitment and production boundaries. [S0902]

GFT recommends approaching any potential feeder centre with a task map and a capacity question. Ask which activities the centre actually teaches, which equipment trainees use, how assessment works and whether instructors are available. Then agree a trial assessment without promising employment or institutional status. A useful bridge would recognise demonstrated fabric handling while adding the industrial operation, quality criterion and reporting routine required by the proposed factory. It should preserve the centre's own purpose rather than treating it as a captive recruitment office.

The inherited register reports CICAM Garoua utilisation of 33.7 percent in a July 2023 report. That historical plant measure cannot identify a currently available pool of former employees. It does not reveal who has left, who wants to move, which maintenance tasks they can perform or whether their experience matches the proposed machines. An applicant search may investigate transferable experience, but must not convert underutilised capacity into an assumed supply of industrial supervisors. [R12]

A proposed northern recruitment exercise should distinguish operators, mechanics, work-study candidates and potential supervisors. Use a fabric task for an operator, a controlled diagnosis task for a mechanic and a measurement exercise for a work-study candidate. Ask supervisor candidates to explain an instruction, interpret a production record and coach a colleague. These are suggested selection boundaries. Curriculum sequencing and final qualification standards belong to the wider training plan, rather than being inferred from the candidate's previous employer or trade.

For retention, ask candidates to describe the conditions under which they could accept and keep the offered job. Record transport, caring responsibilities, housing and the predictability of pay, with consent and appropriate confidentiality. Do not treat proximity to cotton production as evidence of willingness to undertake a factory shift.

Equally, do not presume that rural experience prevents industrial learning. The assessment should reveal a trainable task gap and a feasible employment arrangement, not assign a fixed capability to a place.

Before naming a northern feeder relationship in a staffing budget, require a documented scope, an instructor availability check and permission to describe it. A letter expressing interest would justify further design, while an agreed assessment timetable would justify scheduling candidates. Neither would prove that trainees can run production. Keep the budget conditional on demonstrated outcomes so a promising craft initiative is neither overstated nor burdened with commitments it has not accepted.

Agree how a failed conversion assessment will be handled before recruiting through a centre. Give applicants useful feedback and distinguish a mismatch with the proposed job from a judgement about their craft. Provide a route to reassessment where a teachable gap is identified. Do not require a feeder to exclude promising learners merely to improve a reported pass rate. Its referral record should retain applicants who could not attend or who declined the terms, so the sponsor can understand where the route loses candidates.

9.3

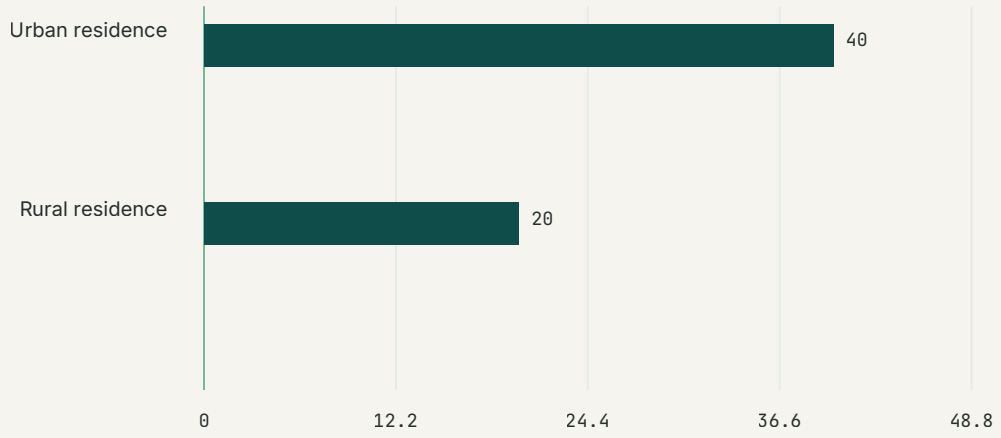
Historical rural disparities justify support design, not city-level skill assumptions

The ILO's State of skills report (2020), citing EESI 2010, records prior vocational-training exposure of approximately four in ten people in urban areas and two in ten in rural areas. These historical national categories are not city estimates or industrial qualification rates. [S0901]

The distinction is visible in **Exhibit 35**, p. 135. The chart preserves the original categories instead of renaming them after candidate locations. Its purpose is to prompt investigation of access barriers, not to score people or forecast their learning speed. GFT recommends checking the content of any prior training against the proposed operation. An applicant without a formal credential should still have the opportunity to demonstrate useful experience through the same practical assessment.

EXHIBIT 35 / PERCENT WITH PRIOR VOCATIONAL-TRAINING EXPOSURE, APPROXIMATE

Historical training exposure differed by residence, not candidate city



DERIVED [S0901] ILO State of skills: Cameroon (2020), printed page 10, citing EESI 2010: four in ten urban and two in ten rural. Values expressed as 40 and 20 percent. Historical national residence categories; neither is a current Douala or Garoua rate, an industrial qualification rate or a probability of passing assessment.

The World Bank's country diagnostic, dated 20 June 2016, reports rural poverty incidence of 56.8 percent and urban incidence of 8.9 percent using the 2014 household survey. These historical figures identify a large difference in material circumstances. They cannot determine a candidate's reservation wage, expected retention or current ability to finance travel. GFT recommends investigating those constraints directly, rather than using poverty as a proxy for cheaper labour. [S0904]

The practical response should be an accessible assessment process. Publish the tasks in language applicants understand. Explain whether travel and attendance costs are reimbursed, when a decision will arrive and whether any training offer includes a job. Separate the occupational test from avoidable application barriers. A candidate who cannot attend because transport money is unavailable has not failed a mechanical diagnosis task. Record the reason accurately so the recruitment model can distinguish access from capability.

Relocation should be attached to a particular role and voluntary acceptance. Prepare a written offer describing location, pay, housing arrangements, transport and the support available to accompanying dependants where relevant. Obtain quotations for the proposed arrangement. A relocation package that attracts an acceptance but cannot sustain attendance is an incomplete staffing solution. Keep the expense visible as relocation, rather than hiding it inside a lower assumed regional wage.

An illustrative planning envelope might test relocation of 15 to 20 technical recruits, but that range is a modelling assumption, not an observed northern shortage. Size the actual requirement by subtracting locally assessed, accepted candidates from the task-specific establishment. Run the same calculation in the corridor. This prevents relocation becoming a fixed penalty attached to Garoua before the employer has tested whether suitable local candidates exist.

For each critical vacancy, GFT recommends recording a lead candidate, a substitute route and the remaining unproved task. The plant manager should review that record against the intended shift pattern. Human resources should verify willingness and employment terms; the technical assessor should verify capability. The sponsor should see both judgements. This division makes a skills constraint actionable without turning regional averages into hiring decisions.

Protect the comparison against sampling bias. An institution advertising only to its strongest graduates cannot be compared directly with an open community recruitment exercise. Record the invitation channel, eligibility rule and reasons for non-participation. Use equivalent equipment and instructions where practicable, and disclose any difference in assessor support. The sponsor needs to know whether an apparent readiness gap belongs to the candidate pool, the selection method or the task itself. Where the samples differ materially, retain separate results instead of manufacturing a single regional ranking.

9.4

Corridor recruitment depth must be demonstrated in accepted technical offers

The corridor hypothesis is that a broader search among technical institutions and industrial employers may yield relevant candidates with less relocation. The site study should test it through comparable assessments and offers. It should not claim faster recruitment, bilingual proficiency or a particular wage premium merely because a candidate lives near Douala. Treat those attributes as candidate-specific observations until a suitable local sample establishes a defensible pattern.

GFT recommends constructing role-specific search channels. For mechanical work, seek demonstrated diagnosis and safe reinstatement on the proposed machine family. For work study, seek measurement accuracy and a clear account of how an operation changes. For digital support, seek the ability to preserve records and recover equipment within the permitted access boundary. For supervisors, seek practical communication and shift-control judgement. An employer's sector or an institution's title should open a search channel, not replace assessment.

The institution map should record workshop access, instructor availability and the task scope a provider can support. Ask who can authorise the proposed teaching arrangement and who will assess the occupational task. Check equipment and scheduling directly with the provider before entering its capacity in the recruitment calendar. A national institutional directory can guide the search, but the site model needs confirmation that a particular workshop and instructor can support the intended cohort when required.

Retaining a recruited specialist requires an offer the candidate can sustain. Ask about the proposed commuting route, housing arrangement and progression expectations. Obtain consent before using those details, and aggregate them for site comparison. Compare total employer cost with the candidate's actual acceptance decision. A lower quoted base salary with no accepted applicant is not a staffing advantage. A more expensive offer may be operationally preferable if it fills a critical role with demonstrated capability.

Exhibit 36, p. 137 translates these questions into a proposed location-adjusted recruitment plan. It does not rank either place, assume provider agreements or assign numerical readiness scores. The entries are management actions to commission, with each resulting claim requiring its own evidence. That distinction lets the sponsor change its view when the recruitment exercise produces a result contrary to the original hypothesis.

EXHIBIT 36 / ILLUSTRATIVE RECRUITMENT ACTIONS

Both locations need task evidence before recruitment advantages count

Role or constraint	Corridor test	Garoua test
Operator entry	Sample feasible commutes	Sample feasible commutes
Supervisor entry	Assess coaching and logs	Assess coaching and logs
Technical entry	Verify local accepted offers	Verify local and relocated offers
Training capacity	Check available workshops	Check craft conversion scope
Retention cost	Price terms candidates accept	Price terms candidates accept

ILLUSTRATIVE Illustrative GFT assessment design, not observed local availability, a supplier agreement or a finding about regional wages. Apply equivalent tasks and employment terms before comparing results.

The recruitment exercise should report elapsed time from an authorised vacancy to accepted, assessed availability. Keep unfilled roles in the denominator. Otherwise a recruiter can make a location appear fast by reporting only the easiest appointments. Distinguish the date of acceptance from the date the person can actually start. A notice period, a required relocation or an unavailable assessor can remain a binding constraint after an offer is signed.

GFT also recommends separating a nominally local appointment from a feasible local commute. Ask the candidate to test the intended route at the proposed arrival time, with expenses agreed in advance. Record the result as a candidate-specific feasibility check, not a city transport statistic. Consider the return journey and the arrangements needed when a shift finishes late. If employer transport is necessary, obtain a service quotation and include its fixed commitment in the cost model rather than assigning it informally to the worker.

9.5

Announced industrial poles require scenarios and voluntary skills cooperation

The inherited register records Camtext SA plans for approximately 12,000 jobs at Dibamba and 3,000 at Garoua, with optimal capacity around 2033. It also records an announced SODECOTON-CICAM industrial-pole ambition targeting 2030. These are announced intentions in inherited sources, not confirmation of commissioning or current hiring. Their implications for a smaller employer depend on timing, occupations and actual recruitment, which require fresh verification. [R08] [R10]

GFT recommends a scenario with limited overlapping recruitment, a scenario with simultaneous demand and a scenario with slower project delivery. For each, ask which critical tasks draw on the same assessed candidates. General employment totals cannot establish that overlap. An upstream textile project may require a different occupational mix from garment assembly. Only a role-level demand comparison can show where cooperative training would help or where a smaller sponsor needs a deeper replacement pipeline.

The proposed cooperation should focus on expanding capability. Potential participants could compare task standards, support instructor practice and discuss shared access to equipment where each organisation agrees. Record the scope, payment, assessment responsibility and treatment of trainee records before proceeding. A curriculum discussion is not a partnership announcement; a shared workshop does not guarantee recruitment rights. GFT should describe such arrangements as proposals until there is documented authority to say more.

Avoid agreements that restrict worker mobility or coordinate wages. Any proposed consortium needs appropriate legal review before commitments are made. The workforce model should assume that qualified people can choose another employer. Its response should be clear progression, credible supervision and replacement capability, rather than an assumed right to retain trainees. This is a planning recommendation and not legal advice.

The World Bank's garment-sector study in Lao PDR describes an interaction between worker dissatisfaction, turnover, low capacity utilisation and weak training investment. Its evidence concerns that setting, rather than Cameroon. It is useful here as a mechanism to investigate: repeated replacement can consume training effort while vacancies constrain output. The study does not establish that either Cameroonian site will have a particular turnover rate. [S0903]

Experimental research in Ethiopia likewise found that many applicants who entered industrial work left within months. It does not supply a Garoua or Douala forecast. GFT recommends using such evidence to challenge a presumed retention advantage and to design interviews about actual working conditions. An accepted offer and an appealing recruitment story still need to be followed by observation of attendance, learning and continued employment. [S27]

For any retention measure, define the cohort and observation window before comparing sites. Separate departures, transfers and temporary absence. Record whether a leaving interview was completed and preserve uncertainty where it was not. A proposed retention payment should be assessed for cost and employee acceptance, while its effect remains an estimate until observed. Changing the label of a benefit does not establish that it prevents departure.

A project announcement should trigger a verification task rather than an automatic pay increase. Assign an owner to check the announced development's actual recruitment notices, commissioning evidence and occupational requirements when the sponsor refreshes its staffing plan. Retain the date and source of each update. If evidence remains unavailable, preserve the demand scenario with an explicit uncertainty flag. This allows the employer to prepare replacement capability without claiming that announced industrial capacity has already entered the local labour market.

9.6

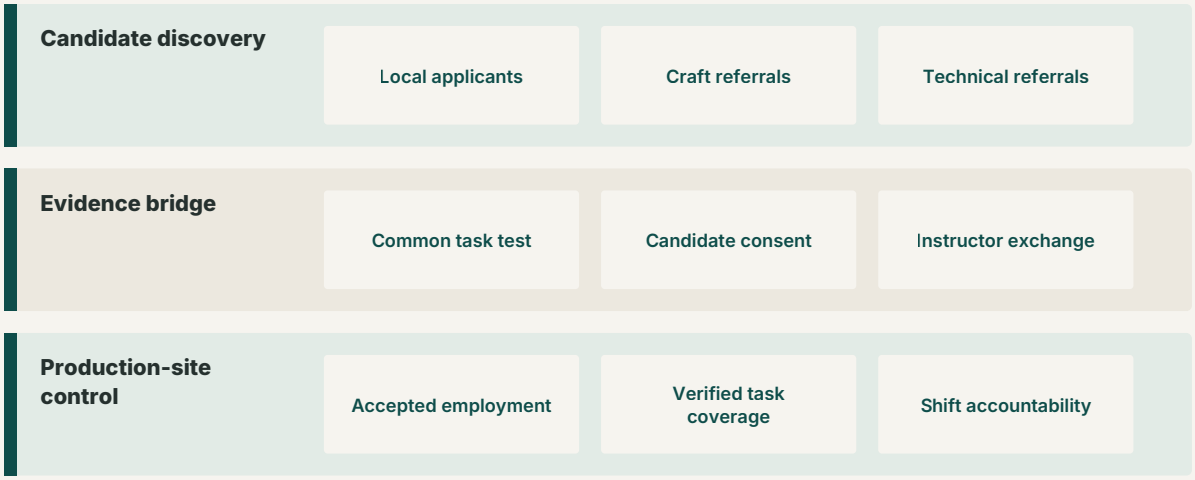
A hub-and-spoke bridge should move knowledge before it moves whole cohorts

A cross-regional bridge can be designed without duplicating the factory. GFT recommends locating production responsibility at the chosen site and using recruitment spokes only where they add assessed capability. A northern craft route might support operator assessment; a technical-institution route might support specialist searches. Those are proposed channels, not exclusive regional functions. Either route should remain open to a suitable candidate from either location.

The architecture in **Exhibit 37**, p. 139 separates candidate discovery, practical verification and shift accountability. Its value is the handover rule: a referral does not become a qualified worker until the production site accepts the evidence and confirms the employment arrangement. The design also keeps an instructor-development route available, so knowledge can travel without requiring every trainee to relocate before anyone has checked their task readiness.

EXHIBIT 37 / ILLUSTRATIVE RESPONSIBILITIES

A proposed talent bridge keeps shift accountability at the production site



ILLUSTRATIVE Illustrative GFT hub-and-spoke design. No institutions are contracted, no locations are selected and no transport or employment commitments are implied. Referral, assessment and acceptance remain separate decisions.

Candidate records should travel only with an agreed purpose and appropriate consent. Carry task results, assessor identity, equipment used and the limits of the assessment. Avoid circulating personal stories as a substitute for evidence. The receiving assessor should be able to determine whether the prior test matches the proposed operation. Where it does not, repeat the relevant task rather than granting a portable internal grade whose meaning changes between institutions.

Instructor movement deserves its own work package. Define the task to be transferred, the local instructor's practice opportunity and the evidence that teaching can continue after the visitor leaves. Budget travel and protected teaching time. A visiting

specialist's presence is not proof of knowledge transfer. The production site should retain a route for technical questions while keeping a named local role accountable for the shift decision.

> **GFT NOTE**
>
> Select the smallest geographical footprint that can sustain the required capability. Before adding a recruitment spoke, show the task gap it addresses, the candidates' willingness to participate and the cost of verification and handover. Keep proposed institutions unnamed in public commitments until their role and permission to describe it are documented. A broader map is useful only when the handovers work.

The site decision should not depend on a provenance story standing in for supply-chain evidence. If the sponsor intends to use northern cotton, the purchasing specification and traceability system must establish that connection independently. Recruitment geography cannot certify fibre origin. Equally, a garment factory serving a distant market does not necessarily need a separate distribution workforce merely because a route appears on a map. Those responsibilities should follow the actual logistics design.

Keep the scope of this bridge distinct from the neighbouring training workstreams. The siting decision determines where candidates enter, what movement is required and who accepts the handover. The training plan then determines how competence is built, while the mentor plan determines how responsibility transfers. GFT recommends reconciling these interfaces before scheduling a cohort, so a location assumption does not quietly become an unbudgeted course or relocation commitment.

The handover should include a fallback for interrupted travel or an unavailable visiting instructor. Identify which activities can proceed locally and which require the missing specialist. Give the production site authority to postpone an assessment when the required equipment or assessor is absent. A remote conversation may support preparation, but should not be recorded as completion of a practical machine task. Keeping this distinction visible prevents a cross-regional bridge from creating paper qualifications faster than it creates usable capability.

9.7

Location-adjusted cost must retain uncertainty and critical-role gates

The site-selection model should expose its workforce assumptions beside freight and power. GFT recommends separate inputs for accepted base pay, relocation and housing, replacement recruitment, pre-hire support and visiting-mentor arrangements. Use local quotations or accepted terms when available; mark the remainder illustrative. Do not use a national cross-sector average salary as a regional technician quote, or an inherited wage-floor statement as confirmation of the law applicable when employment begins.

The illustrative example below uses the same workforce establishment at both sites. It shows how a supposed northern payroll saving can be offset by relocation and retention-related spending. All money values are assumed planning amounts in CFA franc

(XAF) at an illustrative October 2026 price basis. They are neither market quotations nor a compliant wage schedule. Statutory pay, employment terms and employer obligations require current professional verification before offers are issued.

WORKED EXAMPLE: AN ASSUMED PAYROLL ADVANTAGE CAN DISAPPEAR

An illustrative factory has 720 operators paid XAF 80,000 a month in the corridor case and XAF 72,000 in the northern case. Assume 60 supervisors and technicians at XAF 180,000 monthly at either site, with no assumed pay reduction for relocating specialists. Annual direct payroll is therefore (720 × 80,000 + 60 × 180,000) × 12 = XAF 820,800,000 for the corridor and (720 × 72,000 + 60 × 180,000) × 12 = XAF 751,680,000 for the north. The illustrative difference is XAF 69,120,000, or approximately 8.42 percent of corridor direct payroll. These are assumed establishment costs, not GFT employment figures.

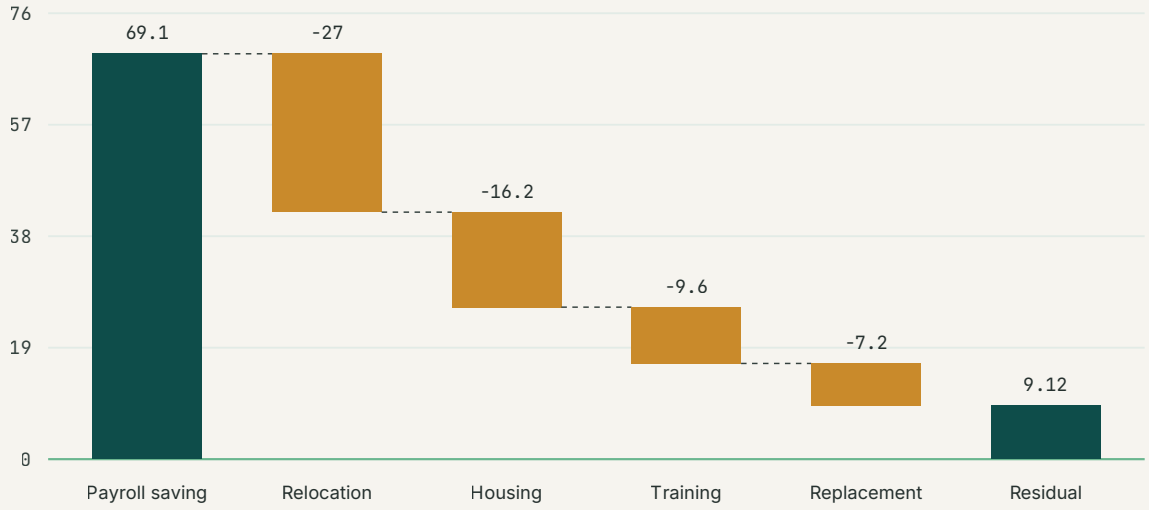
In the same illustrative case, relocate 18 specialists at XAF 1,500,000 each, adding XAF 27,000,000. Add XAF 900,000 annual housing support for each of those specialists, or XAF 16,200,000, and XAF 9,600,000 incremental training support. Hold all other costs equal for this comparison. The first-year subtotal saving becomes 69,120,000 minus 27,000,000 minus 16,200,000 minus 9,600,000 = XAF 16,320,000. This excludes statutory employer charges, other staff, common training costs and production losses, so it is not a complete employment budget or site valuation.

For an illustrative replacement sensitivity, assume 144 operator departures in the north and 108 in the corridor over the same year, an additional 36 replacements. At an assumed incremental cash recruitment and training cost of XAF 200,000 per replacement, the difference is XAF 7,200,000. The subtotal saving falls to XAF 9,120,000. Keep vacancy losses and reduced learning productivity outside that cash item unless separately measured, to avoid double counting. Neither departure count is a local forecast.

Exhibit 38, p. 142 reconciles that illustrative example. The payroll difference is only the opening balance. A site decision based on it alone would ignore the spending required to make the assumed workforce available. The remaining balance is small enough that the sponsor should investigate omitted costs and production effects before treating the example as an advantage.

EXHIBIT 38 / MILLION CFA FRANC (XAF), ILLUSTRATIVE FIRST YEAR

Illustrative relocation and replacement costs consume most payroll savings



ILLUSTRATIVE All inputs are illustrative, not surveyed. Opening: 720 operators x (80,000 minus 72,000) XAF/month x 12 = 69.12 million; identical 60 technical/supervisory salaries cancel. Relocation: 18 × 1.5 million = 27; housing: 18 × 0.9 million = 16.2; incremental training: 9.6; extra replacements: (144 minus 108) x 0.2 million = 7.2. Closing: 69.12 minus 27 minus 16.2 minus 9.6 minus 7.2 = 9.12. Employer charges, other staff and production losses excluded; hold other costs equal.

The illustrative remaining XAF 9,120,000 is exhausted by roughly XAF 1,056 extra monthly operator pay across the assumed establishment: 9,120,000 divided by 720 and then by 12, rounded to the nearest franc. This sensitivity demonstrates why a modest difference in accepted offers can reverse a thin modelled saving. It does not imply that either candidate location actually commands that premium.

GFT recommends retaining ranges for unquoted costs and comparing scenarios with the same output requirement. If the operator wage gap disappears, the apparent northern advantage must disappear from the model too. If the corridor needs more relocation than expected, its cost must increase. Maintain a separate schedule for recruitment delay, with any cost of foregone contribution explicitly estimated rather than equated to lost sales revenue.

The sponsor's decision record should identify the chosen site, unresolved critical roles, accepted employment terms and the conditions required for launch. Attach the assessment evidence and cost basis, then specify what result would reopen the

choice. The recommendation can favour either location when that record supports it. What must remain fixed is the standard: an affordable, qualified and sustainable shift, with uncertainty visible before the sponsor commits to scale.

Choose the place where the shift can hold, then build the bridge that keeps it staffed.

CHAPTER SOURCE NOTES

R03 SODECOTON. Publication date unrecorded; inherited source-text check.

R06 Cameroon Trade Hub. Publication date unrecorded; inherited source-text check.

R07 Ecofin Agency. Publication date unrecorded; inherited source-text check.

R10 Ecofin Agency. Publication date unrecorded; inherited source-text check.

S0902 Bird Story Agency, republished by AllAfrica. 2026-09-03.

R12 Business in Cameroon. Publication date unrecorded; inherited source-text check.

S0901 International Labour Organization. 2020.

S0904 World Bank. 2016-06-20.

R08 Business in Cameroon. Publication date unrecorded; inherited source-text check.

S0903 World Bank. 2012-07.

S27 American Economic Association (AEJ: Applied Economics). 2018-07.

10

Off-Line Vestibule Training Dojos Compress Learning Curves Without Stalling Live Lines

Placing raw recruits directly onto a live progressive-bundle sewing line destroys line balance and spikes defects; an off-line vestibule training dojo uses the Analytical Method of Training to deliver pre-certified operators and supervisors to the floor.

CHAPTER 10
DECISION TEST

Placing raw recruits directly onto a live progressive-bundle sewing line destroys line balance and spikes defects; an off-line vestibule training dojo uses the Analytical Method of Training to deliver pre-certified operators and supervisors to the floor.

Seating an untrained recruit directly onto a live garment assembly line destroys factory utilisation and floods the finishing room with rework. [S31] [S35] In a cut-make-trim sewing line where 30 to 41 sequential operations are balanced to a tight cycle time such as 33 seconds per shirt, throughput is governed by the slowest station on the floor. [S31] When a greenfield Cameroonian venture recruits from a labour market where 89.5 percent of workers earn their living in the informal sector and only 5.3 percent of informal tradespeople have attended a formal vocational institution, nearly every entry-level applicant arrives without industrial sewing conditioning. [S12] [S42] In Green Future Tech's Cameroon textile programme, prepared on 31 January 2024 with 2026 source refreshes, the engineering answer is strict physical separation between initial skill acquisition and commercial production through an off-line Vestibule Training Centre, or Training Dojo, paired with a live spreadsheet Skill Matrix (illustrative programme design). [S35] [S36] [S1003]

Operating a dedicated 30-station vestibule dojo allows a greenfield plant to induct cohorts of 30 novices across four-week cycles using the Analytical Method of Training (AMT), graduating operators only after they sustain 65 percent of Standard Allowed Minutes (SAM) with zero critical quality faults across an eight-hour stamina test (illustrative qualification gate). [S35] [S37] Evaluations from the International Labour Organization (ILO) and International Finance Corporation (IFC) Better Work programme prove that operators who receive basic skills training reach their daily production targets nearly 15 minutes faster per shift than untrained peers, while structured supervisory training lifts line productivity by 22 percent. [S20] [S23] [S1001] Across an illustrative 900-person factory employing 720 direct operators over 250 shifts a year, recovering 15 minutes per worker per shift generates 45,000 productive operator-hours a year, equivalent to 22.5 full-time operators at zero extra payroll (derived arithmetic, illustrative estimate). [S20] [S1001] Every graduate's machine efficiency and four-tier ILUO grade are recorded in the People Log of GFT's manual Performance-Management System (Deliverable 2), enforcing a 3-by-3 Polyvalence Rule while turning Week 4 of the dojo into a blind assessment centre for local supervisor candidates (illustrative operating system). [S01] [S03] [S36] All facility specifications, learning trajectories, and budget figures in this chapter are illustrative planning estimates rather than investment, legal, or tax advice.

10.1

Why on-line training of novices collapses a balanced garment line

Garment assembly is a serial production system in which human psychomotor consistency dictates plant capacity. [S05] [S31] Unlike automated spinning frames or computer-controlled cutting tables, apparel sewing resists full automation because limp woven and knitted fabrics deform under presser-foot and needle-bar forces, requiring human operators to guide plies at every seam. [S05] In an empirical benchmark study of JP Garment Plc in Hawassa, Ethiopia, assembling a long-sleeve woven shirt required 41 workstations operating against a target cycle time of 33 seconds per unit, equivalent to 109 pieces an hour at 100 percent efficiency. [S31] Even with experienced operators, unlevelled task assignments left that baseline line at 67.6 percent efficiency before heuristic line balancing compressed the layout to 30 to 34 stations at 85.9 to 97.35 percent efficiency. [S31]

10.2 THE MATHEMATICAL BOTTLENECK OF MIXING NOVICES INTO A PACED BUNDLE LINE

When managers place raw recruits directly onto a live Progressive Bundle System (PBS) line to learn on the job, the serial mathematics of line balancing turn against the plant. [S31] [S32] Suppose a 35-operator shirt line is balanced to a 33-second cycle time (109.1 pieces per hour theoretical capacity) and management inserts three untrained recruits into intermediate operations such as sleeve-placket binding, cuff attachment, and side-seam overlocking (illustrative line scenario). [S31] Because an unconditioned novice requires an illustrative 95 seconds per piece to align plies and control pedal speed, those three workstations process only 37.9 pieces per hour (3,600 seconds divided by 95 seconds, illustrative calculation). [S31] [S1002]

Within 20 minutes of shift start, two physical failures cascade across the 35-station floor (illustrative mechanism). [S31] [S32] Upstream of the first novice, cut bundles pile up at workstation tables, inflating work-in-progress (WIP) inventory. [S31] [S32] Downstream of the novices, 20 to 25 experienced operators paid at or above Cameroon's statutory minimum wage (SMIG) of XAF 43,969 a month (about US$76 from 23 February 2024) sit idle for 58 to 62 seconds out of every 95-second cycle waiting for bundles. [R14] [S31] Effective line utilisation plunges toward the 33.7 to 48.9 percent utilisation band recorded at Cameroon's state-backed textile incumbent, CICAM, in July 2023, where plant underutilisation cost roughly CFAF 2 billion in 2020. [R12]

Meanwhile, watching bundles stack up beside the table causes the novice to rush pedal strokes before mastering hand-eye coordination. [S35] [S1003] Rushed novices generate skipped stitches, broken threads, raw edges, and oil stains that hide inside 30-piece bundles until End-of-Line (EOL) inspection hours later. [S37] Because manual inspection is only 60 to 70 percent accurate and unpicking a sewn seam consumes three to five times more labour minutes than stitching it right the first time, online novice placement swamps the mending table and erodes Right-First-Time (RFT) yield (illustrative rework multiple). [R29] [S21] [S37]

10.3 WHY FIRST-GENERATION INDUSTRIAL ENTRANTS REQUIRE OFF-LINE CONDITIONING

This bottleneck is acute in Sub-Saharan African greenfield ventures because recruits are largely new to factory work. [S12] [S24] In Cameroon, young people aged 16 to 35 represent 57 percent of the labour force and youth literacy reached 81.8 percent in 2011, yet nearly 70 percent of young jobseekers hold no professional qualification. [S41] [S42] National household surveys compiled by the ILO show that 89.5 percent of Cameroonian employment is informal (86.0 percent of men and 93.2 percent of women), split between informal agriculture (48.6 percent) and informal non-agricultural trades (40.9 percent), while industry employs just 13.4 percent of workers. [R16] [S42]

Even where a recruit has sewn in a neighbourhood workshop, artisanal tailoring habits conflict with industrial cut-make-trim execution. [S35] [S42] In Cameroon's informal non-agricultural sector, 66.9 percent of workers learned their trade alone or through hands-on practice and 24.4 percent trained in small informal shops, against 5.3 percent in formal technical and vocational education and training (TVET) establishments. [S42] An informal tailor constructs a whole garment at a single domestic machine without fixed seam allowances or bundle tickets (illustrative craft baseline). [S33] [S42]

On an industrial line, an operator executes one sub-minute operation hundreds of times a shift at 3,500 to 5,000 revolutions per minute while holding a 1-millimetre seam tolerance (illustrative machine speed). [S31] [S35]

Industrial engineering studies warn that when recruits learn unsystematically on the floor, high early turnover follows: motivated learners quit out of frustration while slow workers remain in a cycle of reverse selection. [S24] [S27] [S1003] Experimental evidence from Ethiopia confirms that most new factory entrants quit within months when rigid pacing and floor friction collide with low initial pay. [S27] Achieving a steady flow of recruits able to meet output and quality standards requires a dedicated facility that follows a systematic off-line training policy. [S35] [S1003]

10.4

Physical layout and equipment of a thirty-station Vestibule Training Dojo

In Section 5 (Operating Model) and Section 9 (Human Resources Plan) of GFT's Cameroon Feasibility Study, the Vestibule Training Dojo is engineered as a permanent department of the factory rather than a temporary corner of the warehouse (illustrative facility design). [S35] [S1003] By isolating initial motor-skill conditioning behind an acoustic glass partition adjacent to the main sewing hall, trainees experience the visual rhythm and professional standards of the plant without obstructing a commercial bundle. [S12] [S1003]

10.5 SPATIAL GEOMETRY AND THIRTY-MACHINE HARDWARE CONFIGURATION

For GFT's illustrative 3.0-million-garment, 900-person plant operating 20 sewing lines, the Vestibule Training Dojo occupies a 180-square-metre ventilated bay (15 metres by 12 metres, illustrative footprint). [S08] [S40] Five rows of six workstations provide 30 industrial training stations mirroring the stitch-head mix and direct-drive servo electronics on the live lines (illustrative equipment schedule): [S35] [S39]

- **Sixteen single-needle direct-drive lockstitch machines (Stations 01 to 16):** Equipped with under-bed thread trimmers, back-tack panels, needle-positioning servo motors, finger guards, and hemmer and compensating presser-foot attachments. [S39] [S40]
- **Eight four-thread and five-thread overlock machines (Stations 17 to 24):** Configured for knit side seams, shoulder joins, and woven shirt serging with differential feed adjustments. [S31] [S39]
- **Three three-needle flatbed interlock machines (Stations 25 to 27):** Set up for knit bottom hemming, sleeve hemming, and neckband topstitching with folder guides. [S31]
- **Two computerised specialty machines (Stations 28 and 29):** One electronic bar-tacker and one automatic buttonhole / button-sew pair for stress-point reinforcement and plackets. [S31] [S39]
- **One inline quality and pressing station (Station 30):** Outfitted with a daylight inspection table, tape measures, tolerance templates, a broken-needle lockbox, and a vacuum steam iron. [R29] [S37] [S40]

Pricing this 30-station package alongside workbenches, adjustable chairs, General Sewing Data (GSD) stopwatches, and visual boards requires an illustrative capital allocation of US$48,000 (approximately XAF 28.8 million at 600 XAF per US dollar), carried in Bucket 1 of GFT's workforce budget. [R32] Every machine carries the needle-bar finger guards, belt covers, and thermal controls required by the 2022 ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear. [S40]

10.6 TRAINER-TO-TRAINEE RATIOS AND PERFORMANCE-MANAGEMENT SYSTEM REHEARSAL

Line supervisors lack the time and training to coach novices while patrolling 35 live stations. [S35] [S1003] GFT staffs the 30-station dojo with one permanent Master Vestibule Instructor (mentored in Phase 0 by GFT's imported Master Quality and Vestibule Trainer) and two full-time Cameroonian Assistant Trainers, establishing a 1-to-10 trainer-to-trainee ratio across a 30-recruit cohort (illustrative ratio). [S35] [S1003]

During Week 1 machine-control drills, the three instructors stagger bench rotations so each trainer coaches sub-groups of three to five learners at a time, respecting the industry finding that tight instructor ratios (1:3 during initial needle control and 1:10 during follow-on line support) compress training times, whereas 1:20 rooms cause losses and six-to-eight-week delays. [S1003] Operating on four-week cycles across 48 working weeks a year, a single-shift 30-station dojo inducts 10 to 12 cohorts annually (300 to 360 recruits a year), expanding to 540 trainees a year during Phase 1 and Phase 2 peaks by adding an afternoon shift (illustrative capacity). [R16] [S35]

The dojo also serves as the rehearsal room for the manual Performance-Management System (Deliverable 2) and the Digital Strategy (Deliverable 3). At the front stands an hour-by-hour visual board identical to the boards on Lines 1 to 20, while every station carries a three-colour Traffic Light System (TLS) card holder (Green, Yellow, Red) and an autonomous maintenance checklist (illustrative setup). [S22] [S37] [S39] Each morning at 07:45, trainees and instructors hold a 10-minute rehearsal huddle to review yesterday's attendance, stitch accuracy, and simulated defects per hundred units (DHU), making hourly logging and inline quality checks automatic reflexes before Week 4 graduation. [S12] [S22] [S37] [S40]

10.7

The Analytical Method of Training decomposes sewing into four progressive weeks

Rather than handing a novice a cut bundle on Day 1, GFT implements the Analytical Method of Training (AMT), an industrial engineering pedagogy that decomposes sewing into elementary psychomotor motions, quality checks, and stamina builds across a 20-day (160-hour) syllabus under Cameroon's statutory 40-hour working week. [R16] [S35] [S1002]

10.8 PRE-INDUCTION DEXTERITY SCREENING AND RECOGNITION OF PRIOR LEARNING FAST-TRACKING

Before Day 1, candidates complete a 30-minute practical assessment screening fine finger dexterity (pin-board assembly), binocular visual acuity and colour discrimination, hand-foot pedal coordination, and basic numeric literacy. [S35] [S1003] Spending 30 minutes to assess trainability eliminates unsuitable placements early and prevents first-week turnover. [S1003]

Candidates with prior informal tailoring experience (from Cameroon's 66.9 percent self-taught and 24.4 percent small-workshop informal workforce, or northern weaving and sewing initiatives such as the Gaaraadji centre in Garoua) sit a two-day Recognition of Prior Learning (RPL) test aligned with Cameroon's Ministry of Employment and Vocational Training (MINEFOP) validation framework. [S19] [S33] [S42] Candidates demonstrating clean lockstitch control enter a three-week conversion track focused on sub-minute SAM pacing, overlock polyvalence, and national Diplome de Qualification Professionnelle (DQP) certification linked to World Bank PADESCE competency-based training (CBT) standards (illustrative RPL bridge). [S17] [S18] [S19] [S42]

10.9 WEEK-BY-WEEK SYLLABUS OF THE TWENTY-DAY VESTIBULE AMT PROGRAMME

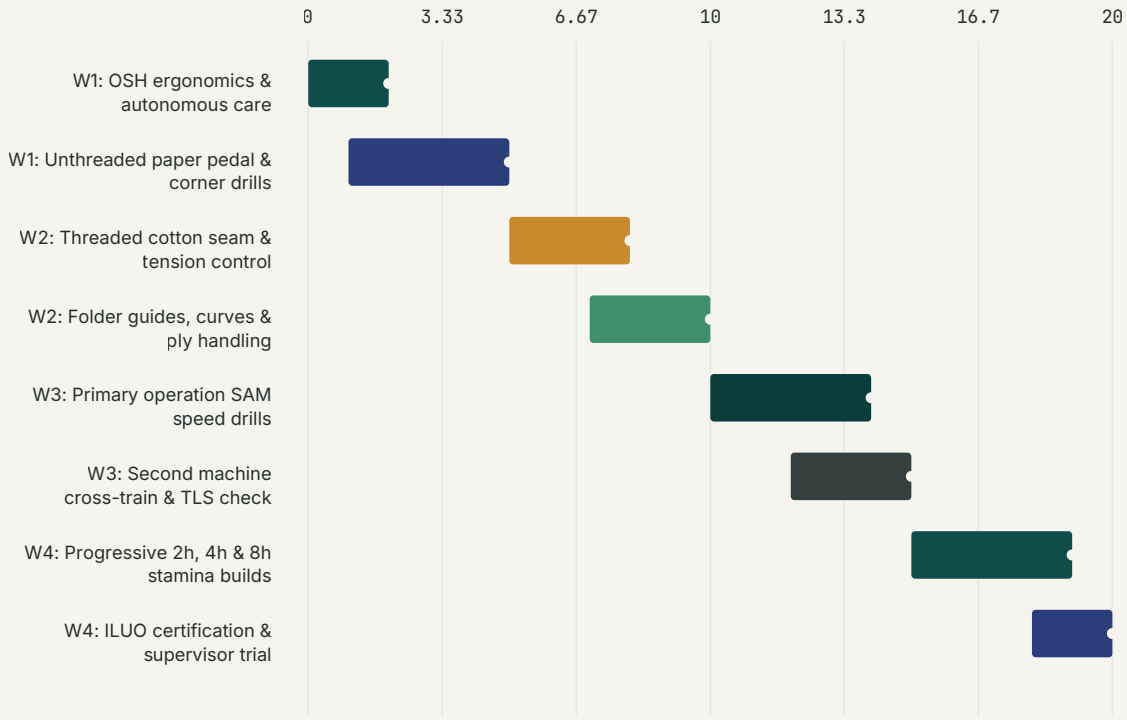
For standard first-generation entrants, the 20-day vestibule curriculum advances through four five-day stages, mapped in **Exhibit 39**, p. 150: [S35] [S37] [S39] [S40]

1. **Week 1 (Days 1 to 5): Ergonomics, Autonomous Care, and Unthreaded Paper Control.** Trainees begin with occupational safety and health (OSH) conditioning under the ILO Code of Practice, followed by five-minute autonomous maintenance: brushing lint from feed dogs and the rotary hook race, checking the oil-sight glass, and changing needles. [S39] [S40] Days 2 to 5 use unthreaded machines at controlled speeds (1,500 to 3,500 rpm) on printed paper sheets: stopping needle-down at corner marks along straight lines, 6-millimetre parallel tracks, squares, S-curves, and spirals (illustrative drill). [S35]
2. **Week 2 (Days 6 to 10): Threaded Cotton Swatch Control and Folder Attachments.** Trainees thread their machines and sew cut swatches of SODECOTON-sourced cotton fabric. [R03] [S1003] Because needle-running time is only 25 to 35 percent of a sewing cycle while 65 to 75 percent is fabric handling, Week 2 trains motion economy: picking up two plies simultaneously, matching notches without stopping, executing 3-stitch back-tacks, joining curved necklines without puckering, and using hemmer folders and magnetic edge guides to hold a 1-millimetre tolerance (illustrative standard). [S05] [S32] [S35]
3. **Week 3 (Days 11 to 15): Full Operation Breakdowns, SAM Speed Drills, and TLS Self-Inspection.** Each trainee learns two primary operations from GFT's ready-to-wear and uniform styles (such as single-needle collar topstitching and four-thread overlock shoulder joining) plus one secondary machine class. [S31] [S36] Trainees sew 10-piece and 30-piece bundles against stopwatch SAM targets while inspecting their own first and last pieces against the 40-defect visual lexicon under the inline Traffic Light System. [R29] [S35] [S37]

4. **Week 4 (Days 16 to 20): Stamina Runs, PMS Log Simulation, and Supervisor Diagnostic Trials.** Week 4 builds stamina through continuous runs: 1 hour on Day 16, 2 hours on Day 17, 4 hours on Day 18, and a full simulated 8-hour shift on Day 19 (illustrative stamina protocol). [S35] [S1002] To graduate on Day 20, the trainee must sustain at least 65 percent SAM efficiency across the 8-hour test with DHU below 4.0 and zero Red TLS cards, while top-quartile performers complete the two-day mini-line leadership trial. [S01] [S36] [S37]

EXHIBIT 39 / TRAINING DAYS (FOUR 5-DAY WEEKS)

Twenty-day Analytical Method of Training curriculum inside the thirty-station Vestibule Dojo



ILLUSTRATIVE [S35] [S37] [S39] [S40] Illustrative GFT 160-hour vestibule syllabus aligned with Cameroon's 40-hour statutory week (R16), ILO OSH Code of Practice (S40), autonomous maintenance (S39), Traffic Light System quality control (S37), and systematic operator training principles (S35).

The sequence in **Exhibit 39**, p. 150 ensures that no recruit touches commercial fabric until motor control and machine care are established in Week 1, and no recruit enters a live line until 8-hour stamina and secondary-machine cross-training are verified in Week 4 (illustrative gate). [S35] [S1003] While this 20-day schedule is an illustrative planning norm for first-generation recruits, RPL fast-track candidates compress Weeks 1 and 2 into five days, graduating in 15 days.

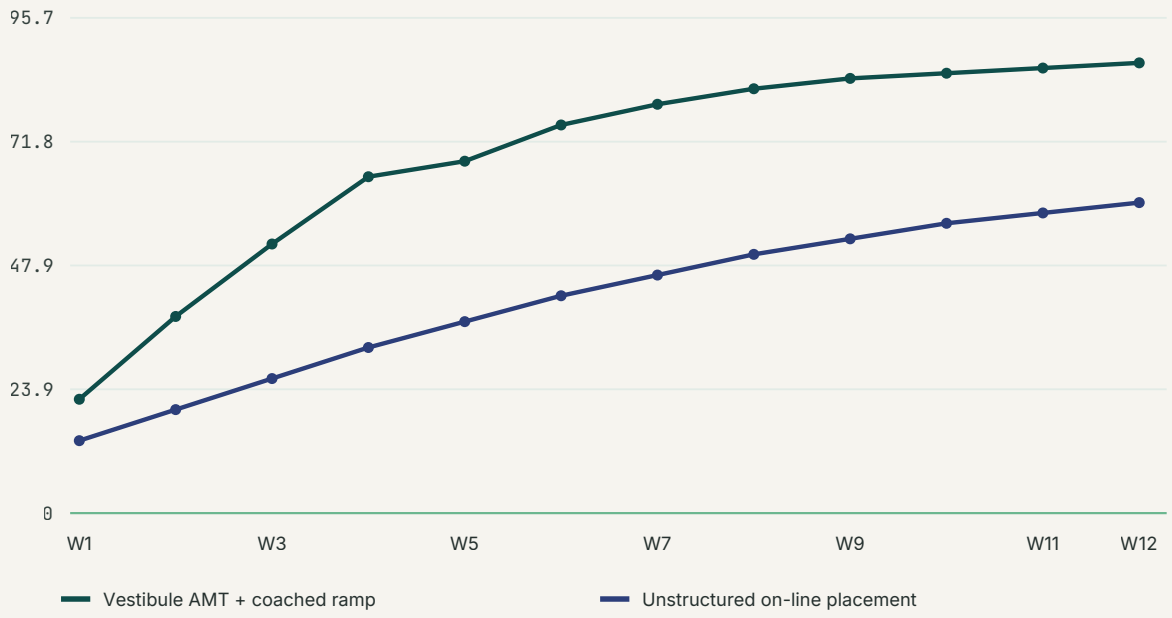
10.10 COMPARING THE TWELVE-WEEK LEARNING CURVE: VESTIBULE AMT AGAINST UNSTRUCTURED FLOOR PLACEMENT

An operator's learning curve plots efficiency (standard minutes produced divided by working minutes attended) against cumulative weeks on the task to set daily targets, lead times, and learning-period incentives. [S1002] **Exhibit 40**, p. 151 compares the 12-week operator efficiency trajectory of GFT's four-week off-line Vestibule AMT

plus eight-week coached floor transition against unstructured on-line placement, derived from systematic trainer benchmarks and Better Work time-to-target findings. [S20] [S35] [S1001] [S1002]

EXHIBIT 40 / OPERATOR EFFICIENCY (% OF STANDARD SAM)

Systematic Vestibule AMT compresses operator time to reach seventy-five percent efficiency from twelve weeks to six weeks



DERIVED [S20] [S35] [S1001] [S1002] Derived illustrative learning-curve model based on apparel learning-curve methodology (S1002), systematic trainer compression of recruit ramp times (S35, S1003), and Better Work empirical evidence of faster daily target attainment (S20, S1001). Weeks 1 to 4 of the Vestibule AMT series occur off-line in the training dojo; Weeks 5 to 12 occur on the live sewing line with 1:10 transition coaching.

Two operational differences stand out in **Exhibit 40**, p. 151. First, during Weeks 1 to 4, when the unstructured recruit drags a live line down to 14 to 32 percent efficiency, the Vestibule AMT trainee is inside the off-line dojo climbing from 22 to 65 percent efficiency on practice swatches without costing the main floor a single minute of balancing loss (illustrative trajectory). [S31] [S35] [S1002] Second, when the Vestibule AMT graduate steps onto a live line in Week 5 at 65 percent efficiency supported by a 1-to-10 transition trainer and a trained supervisor, she crosses the 75 percent target band by Week 6 and reaches 85 to 87 percent by Weeks 10 to 12, whereas the uncoached worker plateaus near 60 percent at Week 12. [S20] [S35] [S1003] Because this trajectory is a derived planning curve rather than a forecast for every individual, GFT tracks actual cohort curves weekly in the Capacity and Utilisation Ramp Planner (`ramp-planner`).

10.11

Empirical evidence on basic skills training shows fifteen minutes faster daily target attainment

The financial case for funding an off-line vestibule dojo and shop-floor trainers rests on econometrics from global garment supply chains. [S20] [S1001] Since 2007, researchers at Tufts University have conducted independent impact assessments of the joint ILO and IFC Better Work programme, analysing nearly 15,000 survey responses from garment workers and 2,000 responses from factory managers across Haiti, Indonesia, Jordan, Nicaragua, and Vietnam. [S20] [S1001]

10.12 ECONOMETRIC PROOF FROM BETTER WORK AND ILO SCORE EVALUATIONS

The Tufts impact assessment isolated the direct effect of structured worker and supervisor training on daily output speed. [S20] [S1001] Garment workers who participated in basic skills training reached their daily production targets on average nearly 15 minutes faster every shift than workers who had not participated. [S20] [S1001] When basic operator training was combined with Better Work's three-day Supervisory Skills Training (SST), lines overseen by trained supervisors achieved a 22 percent increase in productivity relative to lines managed by untrained supervisors, alongside fewer unbalanced line pile-ups, lower turnover, and lower injury rates. [S20] [S22] [S23] [S1001]

Conversely, workers concerned about verbal abuse from untrained supervisors took almost one extra hour per day to reach their production target, even after controlling for education, training, and experience. [S20] [S1001] Over four years in Better Work Vietnam, improvements in training and working conditions raised the average factory's revenue-to-cost ratio by 25 percent (a cumulative effect of 0.62 on a mean ratio of 2.48). [S1001] Similarly, the ILO's Sustaining Competitive and Responsible Enterprises (SCORE) programme across Brazilian sewing workshops monitored by SENAI found that shop-floor cooperation and quality training raised average productivity by 15 percent and cut rework rates by 12 percent. [S21]

10.13 ARITHMETIC OF THE FIFTEEN-MINUTE DAILY GAIN ACROSS A 720-OPERATOR FLOOR

In a greenfield Cameroonian factory governed by a standard 40-hour working week (480 minutes per shift across five days, up to a 48-hour maximum with overtime at 1.2 times base pay), saving 15 minutes per operator per shift alters unit economics through three channels. [R16] [S20] [S1001] First, 15 minutes out of a 480-minute shift recovers 3.125 percent of total paid shift time into good garment output (derived arithmetic). [R16] [S1001] Second, finishing the daily target 15 minutes earlier eliminates chronic end-of-shift overtime at the 1.2x statutory premium. [R16] [S20] Third, operators who hit their target inside standard hours qualify consistently for GFT's yield-gated efficiency bonus (Chapter 12), raising earnings above the XAF 43,969 monthly SMIG floor and curbing early quitting. [R14] [S24] [S27]

WORKED EXAMPLE: ANNUAL PRODUCTIVE HOURS AND UNIT-COST RECOVERY FROM THE 15-MINUTE TRAINING GAIN

Consider GFT's illustrative 3.0-million-garment, 900-person factory ramping across three phases over 250 working shifts a year (50 weeks of 5 shifts under Cameroon's 40-hour standard week). [R16] Applying the Better Work finding of 15 minutes (0.25 hours) saved per trained operator per shift yields the following derived capacity recovery: [S20] [S1001]

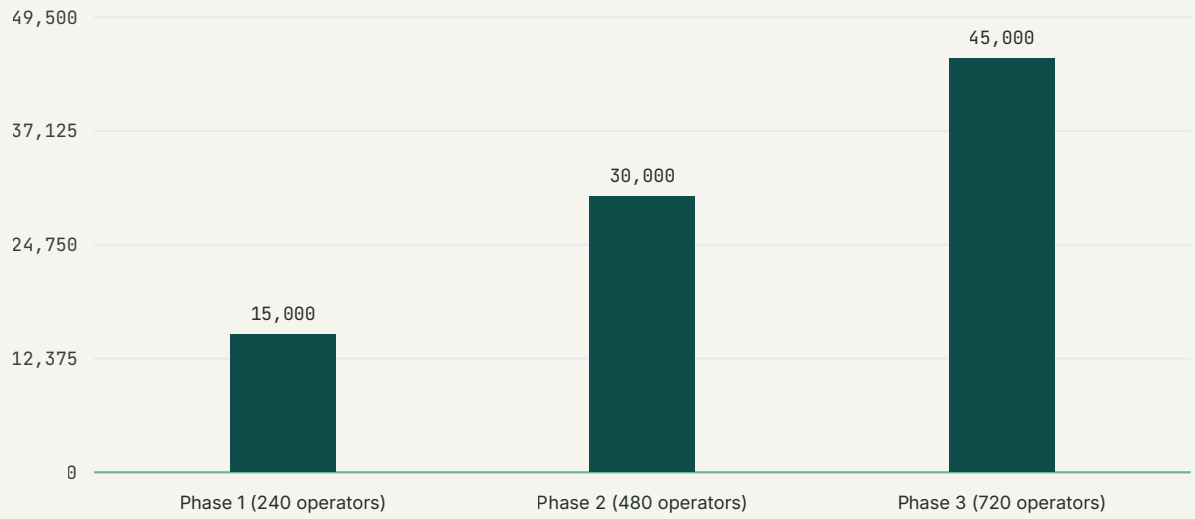
- **Phase 1 (8 sewing lines, 240 direct operators):** Saving 0.25 hours per operator across 250 shifts recovers `240 * 0.25 * 250 = 15,000` productive operator-hours per year. Divided by a 2,000-hour work year (`250 shifts * 8 hours`), this equals **7.5 full-time equivalent (FTE) operators** (illustrative calculation). [R16] [S1001]
- **Phase 2 (14 sewing lines, 480 direct operators):** Saving 0.25 hours per operator across 250 shifts recovers `480 * 0.25 * 250 = 30,000` productive operator-hours per year, equivalent to **15.0 FTE operators** (illustrative calculation). [R16] [S1001]
- **Phase 3 (20 sewing lines, 720 direct operators):** Saving 0.25 hours per operator across 250 shifts recovers `720 * 0.25 * 250 = 45,000` productive operator-hours per year, equivalent to **22.5 FTE operators** added at zero incremental payroll (illustrative calculation). [R16] [S1001]

On a cotton T-shirt or polo with an illustrative work content of 6.0 Standard Allowed Minutes (0.10 standard hours), 45,000 recovered hours at 80 percent line efficiency (`36,000 standard hours`) produce **360,000 additional good garments a year**. At the XAF 43,969 monthly SMIG base wage (`XAF 527,628` or about `US$879` a year per operator at 600 XAF/USD), 22.5 FTEs of recovered labour time equal **XAF 11.87 million (about US$19,780) a year** in base wages, before counting avoided 1.2x overtime premiums and fixed-overhead absorption (illustrative arithmetic; not a forecast). [R14] [R16] [R32]

Exhibit 41, `p. 154` illustrates the scaling of these recovered productive operator-hours from Phase 1 through Phase 3 across the 20-line plant. [S20] [S1001]

EXHIBIT 41 / PRODUCTIVE OPERATOR-HOURS RECOVERED PER YEAR

Fifteen minutes faster daily target attainment recovers forty-five thousand productive operator-hours a year at full ramp



DERIVED [R16] [S20] [S1001] Derived arithmetic applying the ILO/IFC Better Work finding of nearly 15 minutes (0.25 hours) faster daily target attainment from basic skills training (S20, S1001) across 250 eight-hour shifts per year (R16) for GFT's illustrative Phase 1 (240 operators), Phase 2 (480 operators), and Phase 3 (720 operators) workforce.

As **Exhibit 41**, p. 154 shows, the 45,000 operator-hours recovered annually at full ramp exceed the 38,400-hour annual training time spent by 240 new recruits passing through 160-hour Vestibule AMT cohorts (`240 * 160 = 38,400 hours`, derived comparison). [S20] [S1001] A trainee's stipend during vestibule training is minor compared with the overhead recovery gained by compressing the learning curve on the live floor. [S1003] While the 15-minute empirical benchmark was measured in Vietnamese Better Work factories rather than Cameroon, GFT uses it as a calibration anchor alongside local stopwatch audits in the Garment Unit-Economics Simulator (`unit-economics`). [S1001]

10.14

Encoding workforce capability in the ILUO and efficiency-percentage Skill Matrix

Graduating a cohort from the Vestibule Dojo solves half the problem; the other half is making each operator's exact capabilities visible to line supervisors and industrial-engineering technicians at 07:45 every morning. [S04] [S36] Where knowledge of which operator can run a five-thread overlock or set a woven collar lives only in a supervisor's memory, morning line rebalancing degenerates into guesswork. [S04] [S36] [S1004]

10.15 STRUCTURE OF THE SKILL MATRIX DATABASE IN GFT'S PERFORMANCE-MANAGEMENT SYSTEM EXCEL PACK

In GFT's Performance-Management System (Deliverable 2, Section 4 and Back Matter), workforce capability is governed through a structured Skill Matrix maintained inside the People Log and the `People and Sustainability` sheet of the companion

Excel workbook. [S36] [S1004] A sewing Skill Matrix is a systematic database recording each operator's historical performance across machine types and garment operations for line setting and rebalancing. [S36] [S1004]

GFT's Excel Skill Matrix records six mandatory fields per operator-operation record, updated at the conclusion of every style batch or monthly review cycle: [S36] [S1004]

1. **Employee ID, Name, and Assigned Line / Wage Band:** Unique identifier (`OP-001` to `OP-720`), line assignment, and SMIG-compliant pay band (Band 1 Floor Operator or Band 2 Polyvalent Floater). [R14] [S1004]
2. **Machine Family Code:** Standardised equipment class (`SNLS` single-needle lock-stitch, `OL4/5` four/five-thread overlock, `FL3` three-needle flatbed interlock, `BH/BT` buttonhole/bar-tack, `SPEC` specialty machine, `PRESS` finishing iron). [S36] [S1004]
3. **Specific Garment Operation and Complexity Grade:** Exact operation name from the Operation Breakdown (`Collar band attach`, `Placket set`, `Sleeve join`, `Side seam overlock`, `Bottom hem`), graded as Grade A, Grade B, or Grade C. [S31] [S36]
4. **Measured Efficiency Percentage:** Quantitative score computed from Line Log output and time-study SAM via `Efficiency % = (Standard Minutes Produced / Total Attended Working Minutes) * 100`. [S31] [S1004]
5. **Measured Defect Rate (DHU) and Right-First-Time Percentage:** Quality score from the inline Traffic Light System and Quality Log. [S37]
6. **Composite ILUO Competency Tier (I, L, U, O):** Four-level functional classification combining speed efficiency and first-pass quality into a floor permission grade (illustrative GFT rubric). [S36]

10.16 THE FOUR-LEVEL ILUO CLASSIFICATION RUBRIC

To support rapid five-minute station swaps during a morning huddle, GFT pairs every efficiency percentage in the matrix with a four-tier ILUO competency code (illustrative thresholds): [S04] [S36] [S37]

- **Level I (Learner / In-Training, 40 to 59 percent efficiency):** Understands machine threading, safety rules, and basic seam geometry from Week 2 or Week 3 dojo drills, but requires oversight and cannot yet hold line pitch independently. [S35] [S36]
- **Level L (Licensed Practitioner, 60 to 79 percent efficiency, DHU below 5.0):** The minimum graduation standard from Week 4 of the Vestibule Dojo (`⩾65 percent` on the primary operation). Executes the operation independently on a live line with zero Red TLS cards. [S36] [S37]
- **Level U (Unassisted Mastery, 80 to 94 percent efficiency, RFT at or above 97 percent):** A Grade-A operator who beats standard SAM across style changeovers while maintaining Green TLS status, eligible for bottleneck assignment and Band 2 progression. [S31] [S36] [S37]
- **Level O (Operational Coach / Master, 95 percent or higher efficiency, RFT at or above 98.5 percent):** Certified to run the station at peak pace, demonstrate motion economy to peers, relieve the Assistant Line Leader, and enter the supervisory assessment track. [S22] [S35] [S36]

Exhibit 42, p. 156 displays an illustrative extract of the efficiency-percentage Skill Matrix for 10 representative operators across six core operations as rendered in GFT's Performance-Management System Excel pack. [S36] [S1004]

EXHIBIT 42 / EFFICIENCY (% OF SAM)

Illustrative efficiency-percentage Skill Matrix mapping ten sewing operators across six core garment operations

	Collar (SNLS)	Placket (SNLS)	Pocket (SNLS)	Side seam (OL4)	Hem (FL3)	Bartack (BT)
OP-01 (Floater O)	96	92	95	84	80	78
OP-02 (Floater U)	88	90	86	82	75	0
OP-03 (Lockstitch U)	91	85	89	62	0	0
OP-04 (Lockstitch L)	74	78	82	0	0	0
OP-05 (Overlock U)	65	0	72	93	86	0
OP-06 (Overlock L)	0	64	0	79	76	68
OP-07 (Flatlock U)	0	0	70	84	94	72
OP-08 (Specialty U)	76	81	0	0	68	95
OP-09 (Dojo Grad L)	68	66	0	62	0	0
OP-10 (Dojo Grad L)	0	0	67	71	65	0

Cell scale: 0 to 96

ILLUSTRATIVE [S36] [S1004] Illustrative extract from the People Log and People-and-Sustainability sheet of GFT's PMS Excel pack (Deliverable 2 Section 4), following the spreadsheet skill-matrix methodology documented in S36 and S1004. Thresholds map to GFT's ILUO tiers: 0% = Not trained, 40-59% = Level I, 60-79% = Level L, 80-94% = Level U, >=95% = Level O.

In **Exhibit 42**, p. 156, reading across any row reveals an operator's multi-skilling breadth (OP-01 is a Band 2 floater certified at 78 to 96 percent across all six operations and four machine classes, whereas OP-09 and OP-10 are Week 4 dojo graduates entering with three Level L certifications between 62 and 71 percent). [S36] [S1004] Reading down any column reveals station depth (five operators in this 10-person group can run Collar (SNLS) at Level L or higher, and four can run Bartack (BT)). [S36] [S1004] Because the heatmap values are illustrative planning records, the Excel pack computes column and row counts automatically via COUNTIF formulas whenever efficiency entries are updated.

10.17

The three-by-three polyvalence rule insulates lines against absenteeism and style shifts

In Section 3 (Six KPI Families) of GFT's Performance-Management System Design, the People family is restricted to two actionable metrics: daily absenteeism and skill-matrix coverage. Reviewing absenteeism and skill-matrix coverage together every week prevents morning absences from stalling a sewing line. [S04] [S36]

10.18 OPERATIONAL DEFINITION OF THE 3-BY-3 POLYVALENCE RULE

GFT operationalises skill-matrix coverage through the **3-by-3 Polyvalence Rule** (illustrative GFT operating rule): [S36]

1. **Station Depth (Three operators per operation):** Every operation in a sewing line's Operation Breakdown must have **at least three operators assigned to that line** certified at **ILUO Level L (60 percent efficiency) or higher** on that operation, including at least one backup certified at Level U ($\geqslant 80$ percent). [S31] [S36]
2. **Operator Breadth (Three operations across two machines per operator):** Every direct sewing operator with six or more months of factory tenure must be certified at **Level L or higher on at least three distinct operations spanning at least two different machine families**. [S36] [S1004]

Line-level skill-matrix coverage is calculated in the `People and Sustainability` sheet as the percentage of stations satisfying the three-operator depth rule and active operators satisfying the three-operation breadth rule (target $\geqslant 85$ percent coverage by the end of Phase 1 and $\geqslant 92$ percent in Phases 2 and 3, illustrative KPI gate). [S36]

10.19 HOW 3-BY-3 POLYVALENCE ENABLES FIVE-MINUTE MORNING CASCADE REBALANCING

Consider the morning attendance shock analysed by National Bureau of Economic Research (NBER) researchers in Working Paper 25865. [S04] Across developing-country garment plants, daily unscheduled absenteeism routinely runs between 4 and 9 percent. [S06] [S24] On a 35-operator progressive bundle line, a 6 to 8 percent morning absence means two or three machinists are missing when the shift bell rings at 07:45 (illustrative shift scenario). [S04] [S31]

On a single-skill line, an absent collar-band or bar-tack machinist shuts down the bottleneck station for hours. [S31] On a GFT line holding $\geqslant 85$ percent 3-by-3 coverage, the supervisor opens the `People Log` lookup table at 07:45 during the 15-minute pre-shift check and executes a three-step cascade swap in under five minutes (illustrative rebalancing protocol): [S04] [S36] [S1004]

- **Step 1 (Cover the critical bottleneck with a Level U/O backup):** If the absent worker occupied a Grade-A bottleneck station (such as `Collar attach` in **Exhibit 42**, `p. 156`), the supervisor shifts `OP-01` (Floater at 96 percent efficiency) or `OP-03` (91 percent on collar) into the collar station. [S04] [S36]

- **Step 2 (Backfill the intermediate station with a cross-trained Level L operator):** The station vacated by the moved operator is filled by a cross-trained operator from a non-bottleneck task holding a secondary Level L/U certification (`OP-08` or `OP-09`). [S04] [S36]
- **Step 3 (Absorb the remaining gap at the lowest-SAM prep task):** The final opening is pushed to the simplest Grade-C prep operation (such as pocket hemming or label tacking), where a recent vestibule graduate can hold flow or the IE technician can combine two short tasks within the 33-second pitch ceiling. [S31] [S32]

Empirical econometrics confirm that supervisors who dynamically reassign workers to tasks where they perform best during shocks shield the line from sharp output drops. [S04] Equally important, when the factory switches styles between woven shirts, jersey T-shirts, and institutional uniforms (Feasibility Study Section 2), a workforce cross-trained across lockstitch and overlock/flatlock machines reconfigures in a single shift. [S31] [S36]

> **GFT NOTE**
>
> A Skill Matrix that is never updated after induction decays into fiction within one quarter, and a polyvalence target without scheduled machine time never happens because supervisors resist releasing busy operators during production hours. [S36] [S1003] [S1004] GFT recommends three governance rules. First, reserve the 30-station Vestibule Dojo every afternoon from 14:00 to 17:00 during non-peak recruitment weeks for **Polyvalence Cross-Training Rotations**: each line sends two single-skill operators for 90 minutes a day over 10 days to earn their second and third machine certifications under the dojo instructors while a floater covers their station. [S35] [S1003] Second, hard-link the Excel Skill Matrix to payroll: an operator cannot advance from Band 1 (the XAF 43,969 monthly SMIG floor) to Band 2 (Skilled / Polyvalent Operator, carrying a 20 to 45 percent base wage premium) without at least three verified Level L/U entries across two machine classes logged in the `People Log` and counter-signed by the IE technician. [R14] [S36] Third, audit five random operator efficiency cells per line during the weekly 45-to-60-minute plant review against actual `Line Log` bundle tickets. [S1004]

10.20

Using the Vestibule Dojo as the objective assessment centre for supervisor candidates

The Vestibule Training Dojo performs a second strategic function: it acts as GFT's blind, objective assessment centre for selecting local Cameroonian line supervisor trainees from within the operator cohort. [S01] [S03] [S22]

10.21 WHY SUBJECTIVE MANAGER NOMINATIONS FAIL AND SUPPRESS FEMALE LEADERSHIP

Relying on middle managers' informal impressions to pick supervisor trainees is empirically broken on two counts. [S01] [S02] [S03] First, in a randomised field study across garment factories by researchers at the National University of Singapore (the STITCH evaluation), researchers asked Factory and Floor Managers (FFMs) to rank which line supervisors they recommended for structured training before randomising

training across all candidates. [S02] [S03] While treated supervisors raised line productivity by 7.3 percent during training and 5.8 percent six months later overall, supervisors highly recommended by middle management showed nearly zero productivity gain from training, whereas supervisors given low recommendation rankings by management achieved productivity jumps of more than 11 percent. [S02] [S03]

Second, traditional factory nominations perpetuate gender exclusion on the garment floor. [S01] In the Bangladeshi garment sector evaluated by University of Warwick researchers, nearly 80 percent of production line operators were women, yet 95 percent of line supervisors were men because workers and managers held biased beliefs against female candidates prior to objective diagnostics. [S01] Yet independent evaluations of the ILO and IFC Better Work programme prove that production lines overseen by Supervisory Skills-trained female line supervisors achieved a 22 percent increase in productivity compared with lines run by untrained supervisors. [S20] [S23] In Cameroon, where 93.2 percent of working women are in the informal economy and 86.9 percent face underemployment, opening an objective promotion pathway from the sewing machine to line supervision is both an operational imperative and a major socioeconomic upgrade. [S33] [S42]

10.22 THE WEEK 4 BLIND LEADERSHIP DIAGNOSTIC TRIAL IN THE VESTIBULE DOJO

To eliminate favouritism and gender bias from Phase 0 onward, GFT embeds a mandatory **two-day Simulated Mini-Line Leadership Trial** inside Days 19 and 20 of every four-week Vestibule Dojo cohort (illustrative assessment protocol). [S01] [S22] Every operator trainee, female or male, who achieves ILUO Level L/U (⩾ 70 percent efficiency with zero Red TLS cards) by Day 18 and scores in the top quartile on a 20-minute written numeric and pattern-logic test is automatically entered into the leadership trial without requiring a manager's nomination. [S01] [S03]

During the trial, the dojo's 30 stations are partitioned into five 6-station micro-lines assembling a standard five-operation garment component. [S31] Each candidate rotates through a two-hour shift as Acting Line Leader of a 6-station loop while two master trainers and the HR Lead score performance blind across four observable shop-floor behaviours, detailed in **Exhibit 43**, p. 160: [S01] [S03] [S22] [S31]

EXHIBIT 43 / SCORING WEIGHT (%) AND PASS CRITERIA

Blind four-part diagnostic scorecard administered in Week 4 of the Vestibule Dojo to select supervisor trainees

Diagnostic exercise	Weight (%)	Planted shop-floor scenario in the dojo	Observable pass criterion (score >=75/100)
1. Bottleneck & WIP spot	30	Station 3 is given an unadjusted guide causing a 55-sec cycle against a 33-sec pitch.	Identifies WIP pile-up within 15 min, times Station 3, and rebalances or adjusts guide.
2. Calm quality coaching	30	Station 4 peer intentionally sews uneven 4-mm hems triggering a Yellow/Red TLS card.	Demonstrates correct hand position calmly without shouting; verifies 5 good pieces.
3. Line Log & SAM math	20	Candidate is handed 4 hours of raw bundle tickets, 18 min downtime, and 6 defect codes.	Completes Excel/paper Line Log and computes line efficiency % and DHU with zero errors.
4. Five-minute mini-huddle	20	Candidate leads a standing shift-close review at the dojo visual board with 6 peers.	States output vs target, names top defect station objectively, and assigns 1 clear fix.

ILLUSTRATIVE [S01] [S03] [S22] [S31] Illustrative GFT supervisor assessment rubric replacing subjective manager nominations (S03) and correcting gender bias (S01) through observable technical and interpersonal exercises modelled on Better Work SST (S22) and line-balancing mechanics (S31).

As shown in **Exhibit 43**, p. 160, the four exercises test the exact daily habits required by GFT's Performance-Management System (Deliverable 2, Sections 4 and 5). [S22] [S31] Exercise 1 tests whether the candidate notices physical bundle accumulation and applies pitch-time reasoning (30 percent weight). [S31] Exercise 2 tests constructive pedagogy under time pressure, screening out candidates prone to the verbal hostility that costs lines nearly an hour a day in Better Work studies (30 percent weight). [S20] [S22] [S1001] Exercise 3 verifies arithmetic accuracy for the daily Line Log and Quality Log (20 percent weight), and Exercise 4 tests structured communication at the visual board (20 percent weight).

Candidates who score 75 points or higher out of 100 are tagged with code SUP-CAND in the People Log Skill Matrix and promoted into Assistant Line Leader trial rotations and the 120-hour GFT Supervisory Skills and Engineering Curriculum (Chapter 11), with a governance floor requiring at least 60 percent of supervisory trainee slots to be filled by qualified women (illustrative target). [S01] [S23] While a dojo simulation cannot replicate every pressure of a 35-person line over a full year, combining objective Week 4 diagnostics with a 90-day Assistant Line Leader floor probation ensures promotion on measured evidence.

10.23 CONNECTING THE VESTIBULE DOJO TO THE EIGHTEEN-MONTH FACTORY RAMP

Across all three deliverables of GFT's Cameroon textile programme, the Vestibule Training Dojo and the ILUO Skill Matrix form the physical valve that regulates factory scale (Feasibility Study Sections 9 and 12; PMS Deliverable 2 Sections 3, 4, and 7). During Phase 0 setup (Months -4 to 0), the 30-station dojo is commissioned four months before commercial sewing lines start, so Cohort 1 operators, Assistant Line Leaders, and local shadow supervisors graduate and populate the initial `People Log` database ahead of Gate 0-to-1 (illustrative rollout sequence). [S35] [S36]

During Phase 1 (Months 1 to 6, 8 lines, 240 operators) and Phase 2 (Months 7 to 12, 14 lines, 480 operators), the dojo runs continuous four-week morning induction cycles to staff each new pair of sewing lines while dedicating afternoon sessions to 3-by-3 polyvalence cross-training and remedial coaching for any operator whose weekly efficiency dips below 65 percent. [S35] [S36] [S1003] By Phase 3 (Months 13 to 18, 20 lines, 720 operators, 3.0 million garments a year), when recruitment shifts to replacing normal attrition (held below an illustrative 15 percent annual target), the dojo transitions into a permanent continuous-improvement, style-changeover pre-production, and supervisory assessment laboratory. [S24] [S35]

A garment line is a chain of measured seconds; train the hand off the line so every station on the line holds the beat.

CHAPTER SOURCE NOTES

S31 Hawassa University (Ethiopian Journal of Engineering and Technology). 2023.

S35 Online Clothing Study. 2019.

S12 Roskilde University Centre for African Economies (CAE). 2017.

S42 International Labour Organization (ILO). 2020.

S36 Online Clothing Study. 2012-03-03.

S1003 Online Clothing Study. 2012-01-02.

S37 Fibre2Fashion. 2013.

S20 ILO and IFC Better Work. 2016-09.

S23 International Labour Organization (ILO). 2016-09-26.

S1001 ILO and IFC Better Work. 2016-09.

S01 University of Warwick Department of Economics (RePEc). 2015.

S03 National University of Singapore Department of Economics (STITCH). 2021-10.

S05 International Labour Organization (ILO). 2022.

S32 arXiv / City University of Hong Kong. 2025-02.

S1002 Online Clothing Study. 2018-01-05.

R14 WageIndicator. Publication date unrecorded; inherited source-text check.

R12 Business in Cameroon. Publication date unrecorded; inherited source-text check.

R29 MDPI; industry inspection literature. Publication date unrecorded; inherited source-text check.

S21 International Labour Organization (ILO). 2024.

S24 World Bank. 2012.

S41 Cameroon Economic Policy Institute (CEPI). 2024.

R16 WageIndicator. Publication date unrecorded; inherited source-text check.

S33 AllAfrica / Inter Press Service. 2026-09-03.

S27 American Economic Association (AEJ: Applied Economics). 2018-07.

S08 International Labour Organization (ILO). 2019-08-26.

S40 International Labour Organization (ILO). 2022.

S39 TextileSchool. 2025.

R32 Wise; XE. Publication date unrecorded; inherited source-text check.

S22 Better Work (ILO and IFC). 2018.

S19 International Labour Organization (ILO). 2026.

S17 Cameroon Ministry of Employment and Vocational Training (MINEFOP / JEME). 2025.

S18 World Bank (International Development Association). 2020-07.

R03 SODECOTON. Publication date unrecorded; inherited source-text check.

S04 National Bureau of Economic Research (NBER). 2019-05.

S1004 Online Clothing Study. 2016-05-09.

S06 International Labour Organization (ILO). 2019-08-26.

S02 National University of Singapore Department of Economics (STITCH). 2021-10.

GREEN FUTURE TECH

LIMITED / HONG KONG SAR

11

Seeded Expatriate Mentors and Promote-From-Within Ladders Localise Floor Leadership

Green Future Tech closes the supervisor gap within an illustrative 18-month horizon by pairing a milestone-contracted cohort of eight foreign master mentors with 60 local supervisor and technician trainees on a structured four-step promotion ladder. [S09]

CHAPTER 11
DECISION TEST

Green Future Tech closes the supervisor gap within an illustrative 18-month horizon by pairing a milestone-contracted cohort of eight foreign master mentors with 60 local supervisor and technician trainees on a structured four-step promotion ladder. [S09]

Localising shop-floor leadership in a greenfield Cameroonian garment plant requires treating foreign expertise as a temporary catalyst rather than a permanent operating crutch. [S09] Importing dozens of expatriate line bosses on open-ended contracts inflates fixed overhead, provokes cultural and linguistic friction on the sewing floor, and traps national workers in low-skilled operator tiers. [S09] [S13] [S24] Conversely, placing uncoached local recruits into supervisory roles on a paced assembly line collapses line balance and spikes defect rework. [S06] [S31] In the Human Resources Plan (Section 9) of Green Future Tech's Cameroon textile programme, prepared on 31 January 2024 with 2026 source refreshes, the answer is a three-part localisation architecture: a structured 120-hour technical and leadership curriculum, a seeded cohort of eight foreign master mentors contracted on 18-month handoff milestones, and a transparent four-step promote-from-within career ladder (illustrative programme model). [S20] [S22]

Across an illustrative 3.0-million-garment, 900-person cut-make-trim factory, this system builds 64 certified Cameroonian floor leaders (36 line and shift supervisors, 12 industrial-engineering work-study technicians, 12 sewing-machine mechanics, and 4 senior quality and computer-vision leads) before the last expatriate mentor exits at Month 18 (illustrative headcount model). [S08] Handoff is governed by practical gates across a staged mentorship timeline (**Exhibit 44**, p. 167), an explicit internal promotion sequence tied to the ILUO Skill Matrix (**Exhibit 46**, p. 171), a four-module curriculum integrating International Labour Organization (ILO) and International Finance Corporation (IFC) Better Work methods with GFT's manual Performance-Management System (**Exhibit 47**, p. 173), and blind diagnostic selection that corrects gender bias (**Exhibit 45**, p. 169). [S01] [S20] [S36] All staffing ratios, schedules, and compensation figures in this chapter are illustrative planning estimates rather than investment, legal, or tax advice.

11.1

Eight master mentors seed shop-floor culture without creating an expatriate enclave

A greenfield garment factory needs seasoned industrial reflexes from the first day of pre-production setup, yet importing a permanent foreign supervisory caste defeats the unit-cost logic of African manufacturing. [S09] [S10] Empirical studies of African garment export parks show that when foreign-owned plants import 40 to 60 expatriate supervisors and mechanics to command lines directly, two failures follow (illustrative benchmark range). [S09] [S11] First, the fully loaded cost of foreign technicians (salaries, housing, flights, visas, and allowances) is prohibitively high for mid-scale manufacturers, frequently consuming more annual payroll than hundreds of local operators paid at Cameroon's statutory minimum wage (SMIG) of XAF 43,969 a month (about US$76 as of 23 February 2024). [R14] [S10] Second, foreign firms without contractual localisation mandates neglect training beyond basic operational tasks, leaving local management trainees without formal instruction during their first six months on the job. [S09] [S1103]

To capture veteran know-how without importing an enclave, Section 9 of GFT's Cameroon Feasibility Study sizes the foreign contingent at eight master mentors during Phase 0 setup, less than 1 percent of the illustrative 900-person full-ramp

workforce. [S08] Rather than acting as permanent line commanders, these eight practitioners are contracted strictly as master trainers whose primary deliverable is certifying their Cameroonian replacements (illustrative contract design). [S09] [S22]

In GFT's illustrative 900-person organogram, validated against the ILO occupational benchmark for African garment firms (4.4 percent managers, 8.7 percent technicians, 45.9 percent skilled operators, 20.3 percent unskilled operators, and 16.3 percent non-production staff), the permanent floor leadership and technical spine comprises 64 local posts: 20 line supervisors, 12 assistant line leaders, 4 shift superintendents, 12 industrial-engineering (IE) technicians, 12 sewing-machine mechanics, and 4 senior quality and edge-vision leads. [S08]

11.2 FUNCTIONAL ALLOCATION OF THE EIGHT SEEDED MASTER MENTORS

To build those 64 local specialists across an illustrative 18-month ramp, the eight master mentors cover four technical disciplines from Month -4 (Phase 0 setup): [S08]

1. **Four Master Garment Line Supervisors:** Each coaches a cluster of local trainees in Progressive Bundle System (PBS) flow, morning skill-matrix rebalancing, hourly board tracking, and the 10-to-15-minute daily huddle specified in GFT's Performance-Management System (Deliverable 2, Section 5, illustrative role). [S04] [S31]
2. **Two Master Sewing-Machine Mechanics:** One mechanical specialist covers rotary-hook timing, looper clearances, feed-dog synchronisation, and cutting tables, while one electromechanical specialist covers servo motors, control boxes, and voltage protection, training 12 local mechanics to hold Mean Time to Repair (MTTR) below an illustrative 18-minute ceiling. [S38] [S39]
3. **One Senior Industrial-Engineering Specialist:** This practitioner leads the 12-week IE boot camp for 12 local BTS and DUT graduates, teaching stopwatch rating, General Sewing Data (GSD) motion economy, Operation Breakdown (OB) drafting, and Ranked Positional Weight (RPW), Largest Candidate Rule (LCR), and Kilbridge-Wester line balancing. [S31] [S32]
4. **One Master Quality and Vestibule Trainer:** This practitioner establishes the 30-station Vestibule Dojo, trains three permanent local instructors in the four-week Analytical Method of Training (AMT), and coaches quality leads in the 40-defect taxonomy, inline Traffic Light System (TLS) patrols, and Tier-1 edge vision exception handling. [R29] [S35] [S37]

Eight mentors cannot run 20 sewing lines alone; they succeed only by working through their local Cameroonian deputies from the first shift (illustrative operating rule). [S09] [S24]

11.3

A one-to-three shadowing protocol localises floor authority across eighteen months

Passive observation does not transfer complex industrial skills. [S09] Across Ethiopian garment parks, local engineering and management graduates reported that skills transfer occurred mainly through informal job-hopping because foreign supervisors

were pressed to meet daily quotas rather than teach. [S09] [S1103] GFT prevents operational urgency from crowding out mentorship by enforcing a 1-to-3 Shadowing Protocol synchronized with the four-phase factory ramp (Feasibility Study Section 12) and the four maturity levels of the Performance-Management System (Deliverable 2, Section 7, illustrative schedule).

Each of the eight master mentors is paired with three local trainee deputies in Cohort 1 during Phase 0 (Months -4 to 0) and Phase 1 (Months 1 to 6), yielding 24 certified local floor leaders by Month 6 (illustrative cohort arithmetic). In Month 7, each mentor takes on three local deputies in Cohort 2 (adding 24 local leaders by Month 12, for 48 cumulative graduates), while top Cohort 1 graduates co-mentor 16 to 20 local trainees in Cohort 3 between Months 10 and 16 (illustrative pipeline model). Allowing for an estimated 12 percent vestibule wash-out rate and 10 percent first-year attrition, inducting 86 candidates across the three cohorts secures all 64 certified national leaders before Month 18. [S06] [S24]

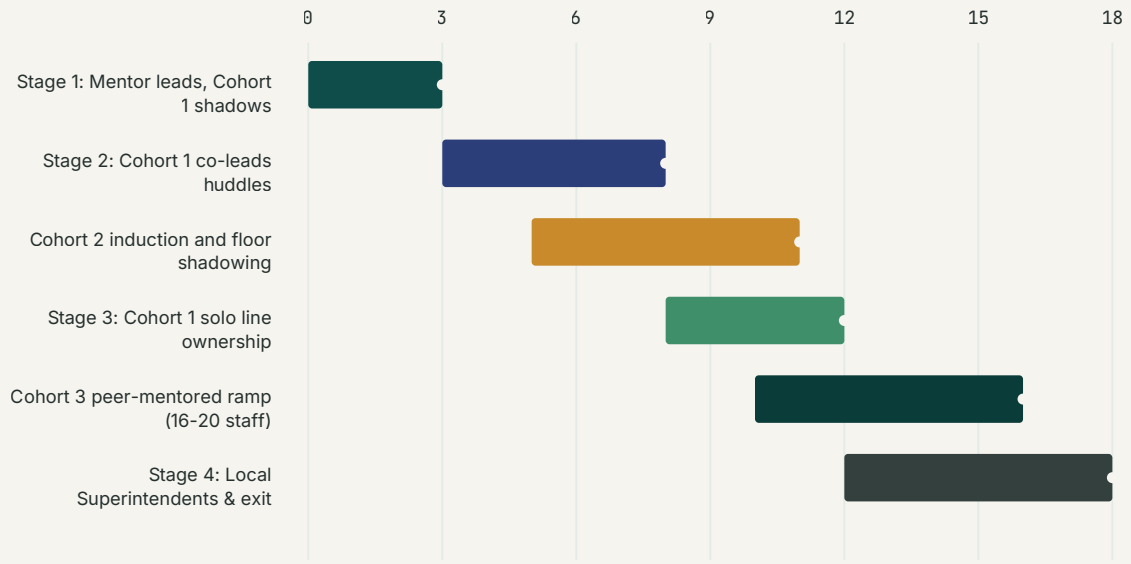
11.4 FOUR STAGED AUTHORITY HANDOFFS FROM SHADOW CAPTURE TO SOLO LEADERSHIP

Authority on the sewing floor transfers in four stages across the illustrative 18-month rollout, as mapped in **Exhibit 44**, p. 167:

- **Stage 1: Shadow and Clean Capture (Months 1 to 3, PMS Maturity Level 1).** During the first 12 weeks on the initial eight lines, the mentor holds primary command while three Cohort 1 deputies shadow every walk, rebalance, and changeover (illustrative rule). From Shift 1, local deputies write and validate the daily Line, Quality, and People Logs in GFT's Excel pack in French and English. [S42]
- **Stage 2: Co-Lead and Active Cadence (Months 4 to 8, PMS Maturity Level 2).** Once a deputy passes the Month 3 practical gate, roles invert. The local deputy leads the 10-to-15-minute daily huddle, executes morning rebalancing via the ILUO Skill Matrix, and directs TLS Red-card quarantines, while the mentor observes and audits pitch times (illustrative rule). [S04] [S22] [S36] [S37]
- **Stage 3: Solo Line Ownership and Root-Cause CAPA (Months 9 to 12, PMS Maturity Level 3).** Cohort 1 graduates assume solo authority over lines 1 to 8 and lead expansion onto lines 9 to 14 with Cohort 2 deputies (illustrative plan). Local leaders own weekly review escalations and the Corrective and Preventive Action (CAPA) register, while mentors shift 70 percent of their time to Cohort 2 coaching. [S21] [S31]
- **Stage 4: Local Peer Mentorship and Expatriate Exit (Months 13 to 18, PMS Maturity Level 4).** The top four Cohort 1 supervisors become Shift Superintendents overseeing four to six lines and co-mentoring Cohort 3 as lines 15 to 20 launch (illustrative progression). Four mentors exit at Month 12, and the final four exit at Month 18 after verifying 60 shifts of target First-Pass Yield (FPY) and Overall Equipment Effectiveness (OEE) under 100 percent local leadership.

EXHIBIT 44 / MONTHS FROM PHASE 1 LINE START

Eighteen-month one-to-three mentorship and authority handoff schedule across three local cohorts



ILLUSTRATIVE Illustrative GFT workforce localisation schedule aligned with Feasibility Study Section 9 and PMS Deliverable 2 Section 7. Month 0 represents Phase 1 commercial line start following a 4-month Phase 0 vestibule induction.

The schedule in **Exhibit 44**, p. 167 staggers handoff so no sewing line experiences an abrupt leadership vacuum (illustrative schedule). Stage 3 and Stage 4 require Cameroonian supervisors and mechanics to run live lines independently for six to nine months while mentors remain reachable on site. [S09] Because this gantt schedule is an illustrative planning baseline, progression from Stage 2 to Stage 3 is gated on competency: if a cohort's lines fail to hold first-pass yield above 93 percent or huddle action closure above 85 percent, the gate holds until the deficit is remediated in the Vestibule Dojo (illustrative gate rule).

11.5

Objective diagnostic trials and temporary rotations break the female promotion bottleneck

A promote-from-within system fails its mathematical purpose if it excludes four-fifths of the talent pool on the sewing floor. [S01] Across global garment hubs, production operators are overwhelmingly women, yet supervision is monopolised by men; in empirical studies of the Bangladeshi garment sector by researchers at the University of Warwick, Innovations for Poverty Action (IPA), and the International Growth Centre (IGC), nearly 80 percent of line workers were female while 95 percent of supervisors were male. [S01] [S1101] [S1102] In Cameroon, where 93.2 percent of employed women work informally and 86.9 percent experience underemployment, formal garment assembly offers a vital industrial career path for young women. [S42] Yet if a Cameroonian factory copies traditional hub habits, it will recruit women for 80 percent of its Band 1 operator seats while filling 90 percent of its Band 3 supervisory seats with men (illustrative baseline risk). [S01] [S42]

11.6 WHY SUBJECTIVE MANAGERIAL NOMINATIONS MISALLOCATE TRAINING AND SUPPRESS FEMALE TALENT

Two bodies of randomised controlled trial evidence explain why conventional factory promotions fail and how engineered selection rules fix them:

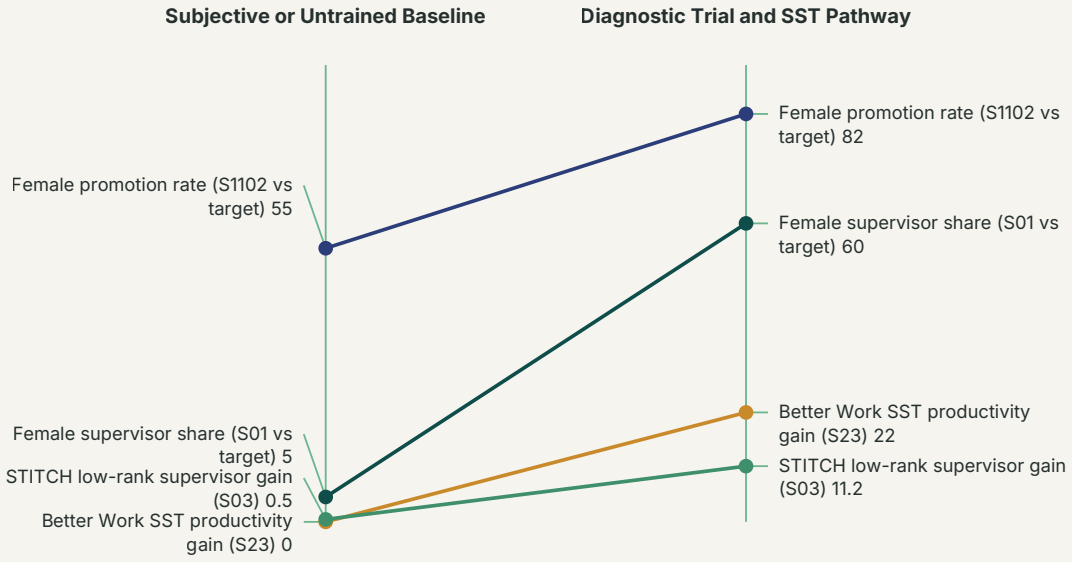
First, subjective nominations by middle management misallocate training. [S02] [S03] In a field evaluation of the STITCH supervisory training programme by economists at the National University of Singapore, lines overseen by treated supervisors raised productivity by 7.3 percent during training and maintained a 5.8 percent productivity edge six months after completion. [S02] Before training, Factory and Floor Managers (FFMs) ranked which supervisors they recommended for training. [S03] Decomposing gains across those rankings revealed an inversion: lines led by highly recommended supervisors showed nearly zero productivity impact, whereas lines led by supervisors in the lowest recommendation tercile achieved productivity gains above 11 percent. [S03] Floor managers direct training toward vocal favourites who have plateaued while overlooking quiet candidates with the largest productivity headroom. [S03]

Second, biased workplace beliefs block capable women from promotion unless firms run structured diagnostic trials. [S01] [S1101] In the 60-factory IGC and 24-factory IPA experiments in Bangladesh, objective baseline diagnostics revealed few skill differences between marginal male and female supervisor candidates, and female trainees outperformed men in management simulations. [S1101] [S1102] Yet female trainees achieved a promotion rate of only 55 percent compared with 85 percent for male trainees under discretionary promotion. [S1102]

When researchers randomly assigned trained female and male candidates to manage production lines, they found that initial subordinate resistance and negative beliefs caused lower evaluations and a temporary performance dip during a female supervisor's first weeks. [S01] [S1101] After four to six months of exposure, however, worker resistance vanished, evaluations equalised, and the productivity of female-led lines caught up completely with male-led lines, leading factories to permanently raise female supervisory retention. [S1101] Moreover, Tufts University evaluations of the ILO and IFC Better Work programme show that lines overseen by Supervisory Skills-trained female supervisors achieve a 22 percent productivity increase over lines led by untrained supervisors. [S20] [S23]

EXHIBIT 45 / PERCENT

Objective diagnostic selection and structured training reverse the gender promotion gap and lift line productivity



SOURCED [S01] [S02] [S03] [S20] [S23] [S1102] Compares documented industry baselines against empirical training and objective-trial outcomes: female share of supervisors (5% baseline in S01 vs 60% GFT target), trainee promotion rate (55% female vs 85% male under biased baseline in S1102), STITCH low-FFM-rank productivity gain (0.5% high-rank vs 11.2% low-rank in S03), and Better Work SST female supervisor productivity gain (0% untrained baseline vs 22% trained in S20, S23).

The paired comparisons in **Exhibit 45**, p. 169 show why GFT removes discretionary manager favouritism from supervisory selection. [S01] [S03] [S23] While the 5 percent female supervisor baseline, the 55 percent promotion rate, the 11.2 percent low-tercile STITCH gain, and the 22 percent Better Work SST surge are empirical observations, the 60 percent female supervisor share and 82 percent parity promotion rate are GFT's illustrative governance targets for Cameroon. [S01] [S03] [S23] [S1102]

11.7 THREE INSTITUTIONAL RULES TO GUARANTEE GENDER-BALANCED FLOOR LEADERSHIP

To ensure the four-to-six-month bias adjustment period documented by IPA never derails newly promoted Cameroonian women, GFT enforces three rules: [S1101]

- **Blind Assessment-Centre Selection in Week 4 of Vestibule Induction:** Every operator and technical recruit who reaches ILUO Level U on sewing accuracy and scores in the top quartile on numeric literacy enters a two-day blind leadership simulation in the Vestibule Dojo, scored on bottleneck spotting, non-hostile coaching, Line Log accuracy, and leading a five-minute huddle (illustrative protocol). [S01] [S03] [S22] [S36]
- **Sixty-Percent Female Quota Across Supervisory Trainee Cohorts:** At least 60 percent of Assistant Line Leader and Line Supervisor trainee seats in Cohorts 1, 2, and 3 are filled by qualified women selected through the blind diagnostic centre (illustrative policy target). [S01] [S23] [S42]

- **Buffered Trial Rotations Before Permanent Line Assignment:** Before taking solo command of a 32-operator line, each female trainee completes a four-month buffered rotation as an Assistant Line Leader on a 10-station zone alongside a visibly supportive master mentor who enforces zero tolerance for harassment. [S23] [S40] [S1101]

11.8

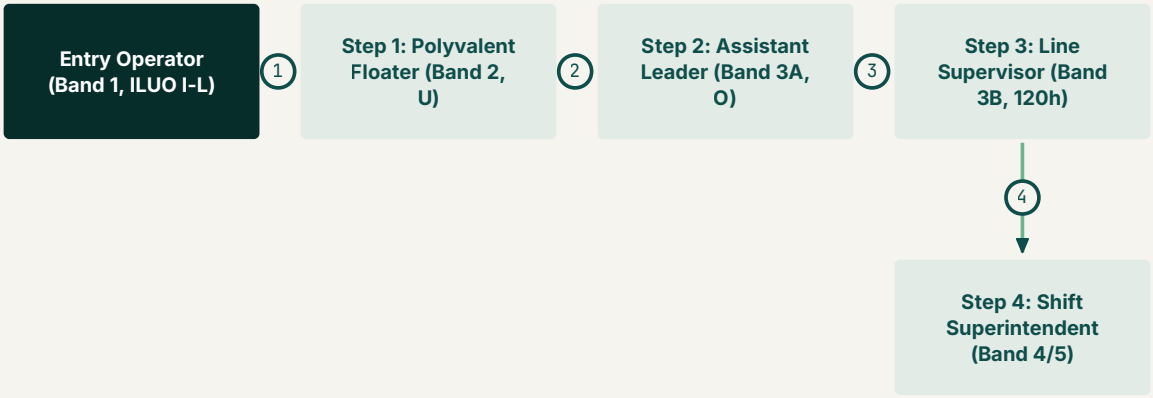
A transparent four-step promotion ladder turns dead-end operator jobs into careers

High early worker turnover drains training investments in African industrial parks. [S24] [S27] In experimental studies of Ethiopian factory recruits, most entrants quit within months because flat entry pay, rigid pacing, and dead-end status made self-employment more attractive; recipients of a US$300 entrepreneurship grant earned 33 percent more with steadier hours than entry factory workers. [S27] SOAS surveys confirm that roughly eight in ten national workers in African manufacturing remain locked in low- or semi-skilled tiers. [S13] If a Cameroonian recruit expects to sew the same 33-second seam at the XAF 43,969 monthly SMIG floor indefinitely, she will treat the factory as a temporary stopgap. [R14] [S27] [S31]

GFT breaks this turnover loop by posting a four-step internal promotion ladder beside every line and inside the Vestibule Dojo (**Exhibit 46**, p. 171). [S24] Each step links to an ILUO skill-matrix grade in the People Log, a defined training module, an objective test, and a transparent SMIG-compliant pay band (illustrative career framework). [R14] [S36]

EXHIBIT 46 / CAREER PROGRESSION STAGES

GFT four-step internal promotion ladder from entry Vestibule Trainee to Shift Superintendent



1. >=80% SAM & >=97% RFT on 3 ops
2. Blind dojo trial & 10-op zone
3. Huddle, Line Log & balance exam
4. 60-shift FPY gate & 5-line zone

ILLUSTRATIVE Illustrative GFT internal career architecture operationalising Feasibility Study Section 9 (Human Resources Plan) and PMS Deliverable 2 Section 4 and 8 (People Log and ILUO Skill Matrix).

As shown in **Exhibit 46**, p. 171, the pathway converts an entry recruit into a senior floor leader through four measurable steps (illustrative progression model):

11.9 STEP-BY-STEP QUALIFICATION CRITERIA, SPANS OF CONTROL, AND WAGE BAND UPLIFTS

- **Baseline Entry: Single-Operation Sewing Operator (Wage Band 1, ILUO Level I to L).** A recruit completes the four-week (160-hour) AMT induction in the Vestibule Dojo at ILUO Level I (40 to 59 percent of Standard Allowed Minutes, SAM) and advances to Level L (60 to 79 percent efficiency with DHU below 5.0, illustrative standard), earning the XAF 43,969 (US$76) SMIG base plus yield-gated bonuses. [R14] [S35] [S36]
- **Step 1: Polyvalent Floater (Wage Band 2, ILUO Level U on three operations).** After three months, an operator sustaining 80 percent SAM efficiency and 97 percent Right-First-Time (RFT) quality completes 40 hours of dojo cross-training (illustrative curriculum). [S35] [S36] Certified at Level U on three critical operations across two machine types, she advances to Band 2, earning an illustrative base uplift of 20 to 45 percent above the floor (XAF 53,000 to XAF 64,000 a month) to cover morning absences. [R14] [S04] [S36]

- **Step 2: Assistant Line Leader (Wage Band 3A, ILUO Level O Coach).** Floaters and technical graduates passing the blind dojo trial at Month 6 complete 60 hours of supervisory instruction while managing a 10-station zone and coaching Yellow TLS card stations, earning an illustrative XAF 85,000 to XAF 115,000 a month (1.9 to 2.6 times SMIG). [R14] [S01] [S22] [S37]
- **Step 3: Certified Line Supervisor (Wage Band 3B, Full 32-Station Line Owner).** Completing all 120 curriculum hours, 1-to-3 shadowing, and the Month 9 to 12 practical exam certifies the deputy to own a 30-to-35-operator line, the Line Log, and the morning huddle at an illustrative Band 3B base of XAF 130,000 to XAF 175,000 a month (US$220 to US$295) plus bonuses. [R14] [R15] [S20] [S31]
- **Step 4: Shift Superintendent (Wage Band 4/5 Bridge, Multi-Line Lead).** At Months 13 to 18, the top four supervisors complete 60 hours of S&OP and CAPA governance to oversee five lines each (160 operators), earning an illustrative XAF 210,000 to XAF 260,000 a month (US$350 to US$435, matching Cameroon's US$359 cross-sector average salary) at less than one-sixth the cost of an expatriate boss. [R15] [S10]

GFT registers Step 2 and Step 3 certifications under Cameroon's Law No. 2018/010 and the Ministry of Employment and Vocational Training (MINEFOP) Competency-Based Approach (CPA / CBT), allowing promoted staff to earn portable national DQP or DTS credentials. [S18] [S42]

11.10

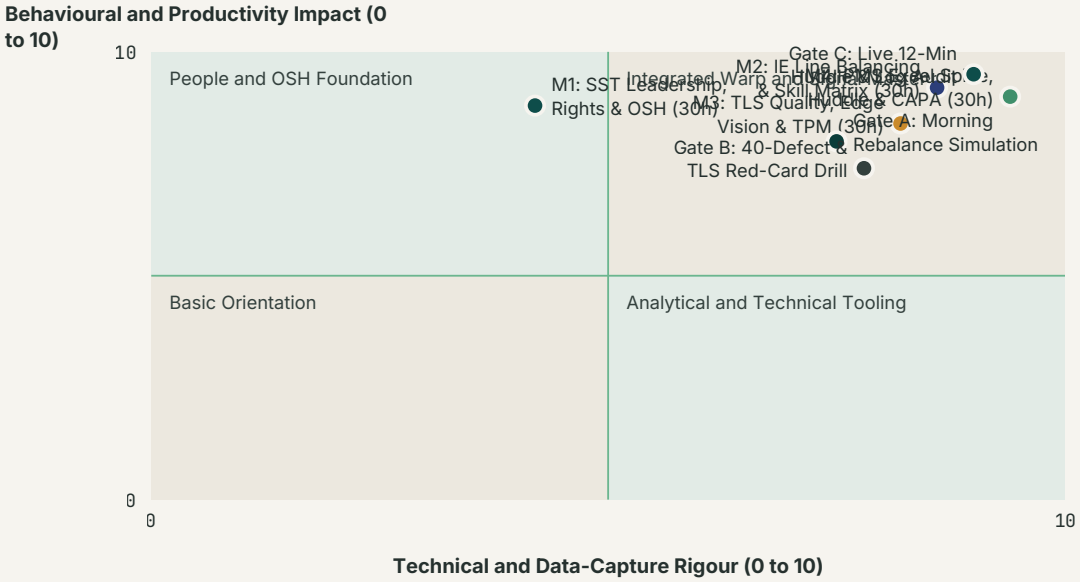
The hundred-and-twenty-hour curriculum unifies human leadership, flow engineering and data capture

Supervisory programmes fail when they teach soft communication in isolation from industrial engineering, or vice versa. [S06] [S22] A polite supervisor who cannot calculate pitch time watches her line starve behind a bottleneck, while a technician who balances a spreadsheet but shouts at operators triggers fear, stitch errors, and quitting. [S20] [S23] [S31]

GFT's 120-hour curriculum integrates ILO/IFC Better Work Supervisory Skills Training (SST), ILO SCORE lean quality cooperation, Hawassa-tested line balancing, and GFT's manual Performance-Management System (Deliverable 2). [S20] [S21] [S22] [S31] Every trainee completes four 30-hour modules split equally across classroom instruction (40 hours), Vestibule Dojo simulation (40 hours), and mentored floor practicum (40 hours, illustrative structure). [S22] [S35]

EXHIBIT 47 / CURRICULUM DESIGN SCORE (0 TO 10 SCALE)

Positioning of GFT supervisory curriculum modules across engineering rigour and floor behavioural impact



DERIVED [R29] [S04] [S20] [S21] [S22] [S31] [S36] [S37] [S39] [S40] Derived curriculum architecture mapping GFT's four 30-hour supervisory modules and three capstone assessments across two dimensions: Technical & Data-Capture Rigour (x-axis, 0 to 10) and Behavioural & Productivity Impact (y-axis, 0 to 10), synthesised from Better Work SST (+22% productivity, S20, S22, S23), ILO SCORE (+15% productivity, -12% rework, S21), heuristic IE balancing (67.6% to >85% efficiency, S31), and PMS Deliverable 2.

The placement in **Exhibit 47**, p. 173 shows how the four 30-hour modules and three practical gates combine technical and behavioural rigour into the upper-right quadrant ("Integrated Warp and Signal Mastery"), using derived 0-to-10 design indices anchored on ILO and Hawassa benchmarks. [S20] [S21] [S31]

11.11 SYLLABUS BREAKDOWN ACROSS THE FOUR THIRTY-HOUR MODULES

1. **Module 1: Floor Leadership, Labour Rights and OSH (30 hours).** Modelled on Better Work SST (which has trained 5,850 supervisors globally) and Chapter 14 of the 2022 ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear, this module replaces shouting with calm four-step task demonstration and stress management. [S22] [S40] It covers Cameroonian labour compliance: the XAF 43,969 SMIG floor, the 40-to-48-hour week with 1.2x overtime, and daily checks on needle guards, mesh gloves, ergonomics, and hydration. [R14] [R16] [S40]

2. **Module 2: Line Balancing and Dynamic Reallocation (30 hours).** Trainees interpret Operation Breakdowns, verify SAMs, and compute Pitch Time and Takt Cycle Time. [S31] [S32] Using African shirt-line data (where RPW and LCR heuristics lifted efficiency from 67.6 percent across 41 stations to between 85.9 and 94.2 percent across 31 to 34 stations), trainees enforce two-bundle WIP caps and drill five-minute morning absenteeism reallocation via the ILUO Skill Matrix. [S04] [S31] [S36]

3. **Module 3: Inline Traffic Light Quality, Edge Vision and Maintenance (30 hours).** Trainees master the 40-defect taxonomy, roving inline TLS seven-piece audits, and Tier-1 edge computer-vision terminals (which lift detection accuracy from the 60 to 70 percent manual baseline to above 90 percent across more than 40 defect

types at up to 60 metres a minute). [R29] [S37] The module also covers auditing five-minute operator autonomous maintenance and escalating andon calls to keep mechanic MTTR below 18 minutes. [S38] [S39]

4. **Module 4: The PMS Data Spine, Huddles and CAPA (30 hours).** Trainees learn to log the supervisor's five controllable numbers (hourly output, DHU/FPY, on-time bundles, downtime causes, and skill-matrix coverage) into GFT's validated Excel pack, chair the 10-to-15-minute daily huddle, and close weekly CAPA tickets that cut rework by 12 percent (Deliverable 2, Sections 2 to 8). [S21]

METHOD

Practical Certification Gate Protocol (Modules 1 to 4) Graduation from Stage 1 to Stage 2 requires clearing three practical gates audited by the Master Mentor, IE Lead, and HR Lead (illustrative assessment rule): 1. **Gate A (Five-Minute Absenteeism Rebalance):** Given a 32-station line balanced to a 33-second cycle time and three simulated morning absences, the candidate must reassign polyvalent floaters using the Skill Matrix within 5 minutes so theoretical capacity stays above 85 percent. [S04] [S31] [S36] 2. **Gate B (Blind 40-Defect and Machine-Fault Diagnostic):** Given 20 defective garment samples and three misadjusted sewing heads, the candidate must classify at least 19 of 20 defect codes (D01 to D40), trigger TLS Red-card quarantine, and assign the right operator or mechanic fix. [R29] [S37] [S39] 3. **Gate C (Live Twelve-Minute Huddle and Log Audit):** Over five shifts, the candidate must record the Line Log with zero validation errors and lead the 10-to-15-minute morning huddle, assigning station fixes without hostility. [S20] [S22]

11.12

Bilingual French-English and vehicular visual lexicons standardise defect and machine codes

Linguistic ambiguity between expatriate mentors, local supervisors, operators, and spreadsheets corrupts both floor morale and digital logs. [S24] [S42] Cameroon's formal TVET system is officially bilingual in French and English across MINESEC, MINESUP, and MINEFOP. [S42] On the floor, operators on the Douala-Dibamba corridor speak French, English, and Pidgin, while recruits in the northern Garoua cotton belt near SODECOTON gins and the Gaaraadji centre speak French and Fulfulde. [R03] [S33] [S42] Meanwhile, foreign mentors often speak English or French as a second language. [S14] [S24]

Left unmanaged, language friction causes mentors to resort to gestures and shouting, driving operator turnover, while vague vernacular notes like *"mauvaise couture"* or *"stitch fault"* lump mechanically distinct failures together and ruin machine-learning training labels (Deliverable 2, Section 4; Deliverable 3, Section 4, illustrative example). [R29] [S20] [S24]

11.13 THE LAMINATED VISUAL POCKET LEXICON AND NUMERIC CODE SPINE (D01 TO D40 AND M01 TO M30)

GFT eliminates linguistic drift through an illustrative visual and numeric code standard across every workstation and spreadsheet drop-down list from Phase 0: [R29]

- **Forty-Defect Taxonomy (D01 to D40):** Aligned with the 40-plus defect classes in GFT's Tier-1 vision model ([^R29]), every defect carries an immutable code (D01 to D12 for fabric and cutting faults; D13 to D32 for sewing faults such as skipped stitch D13, broken stitch D14, open seam D15, and puckering D16; and D33 to D40 for finishing faults, illustrative registry). [R29] [S37]
- **Thirty-Part Machine Lexicon (M01 to M30) and Eight Downtime Codes (C01 to C08):** Critical parts (M01 rotary hook, M02 looper, M03 feed dog, M04 throat plate, M05 folder, M08 servo box) and downtime causes (C01 mechanical, C02 power sag, C03 panel shortage, C05 absence, C07 Red-card stop) match the validation lists in GFT's Excel Line Log (illustrative schema). [S37] [S39]
- **Laminated Pocket Lexicons:** Every supervisor, rover, mechanic, and mentor carries a laminated pocket guide showing a macro photo of each defect (D01 to D40) and part (M01 to M30) with its French, English, and phonetic Fulfulde/Pidgin terms (illustrative toolkit).

When a rover writes D13 / M01 on a Red TLS card, the operator, local supervisor, foreign mechanic, and Quality Log all read the same engineering fact: *skipped stitch from rotary-hook timing* (D13 / M01, illustrative workflow), generating clean fine-tuning labels for GFT's MLOps pipeline (Deliverable 3, Sections 4 and 5). [R29] [S37] [S39]

11.14

Escrow compensation and open systems of record enforce mentor knowledge handoff

When expatriate supervisors receive flat monthly salaries with open-ended renewal prospects, a principal-agent conflict arises: training local deputies to run lines independently makes the expatriate redundant, whereas hoarding computerised machine passwords or setup files makes him indispensable. [S09] [S10] [S1103] GFT resolves this conflict through two mechanisms in Feasibility Study Section 9 and PMS Deliverable 2 Section 8: an Open System of Record and a 30 percent Escrow Completion Bonus (illustrative governance design).

11.15 RULE 1: THE OPEN SYSTEM OF RECORD PROHIBITS PRIVATE TECHNICAL BLACK BOXES

Every technical setting and formula belongs to the plant's open System of Record rather than private notebooks (illustrative rule):

- All Operation Breakdowns, SAMs, and RPW line-balancing sheets live in the shared companion Excel pack accessible to all certified local IE technicians and supervisors. [S31] [S32]
- All programmable bar-tacker, buttonhole, and spreading parameters are posted on laminated French-English machine cards, with admin passwords held jointly by the Plant Manager and local Chief Mechanic deputy. [S39]

- All Line, Quality, People (ILUO Skill Matrix), Cost, and Sustainability Logs reside in the governed PMS workbook, ensuring zero institutional memory walks out the gate when mentors exit. [S36]

11.16 RULE 2: THIRTY-PERCENT ESCROW COMPENSATION GATED ON BLIND DEPUTY AUDITS AND SIXTY-SHIFT YIELD STABILITY

Each master mentor's 12-to-18-month contract splits into a **70 percent Monthly Base Retainer** and a **30 percent Escrowed Handoff Completion Bonus** paid at Month 12 and Month 18 only when three independent gates are met (illustrative contract rule):

- **Verification Gate 1 (Deputy Certification Quota):** At least five of the mentor's six local deputies across Cohorts 1 and 2 pass blind Gate A, B, and C exams audited by the Plant Manager, HR Lead, and MINEFOP CBT assessors (illustrative threshold). [S18]
- **Verification Gate 2 (Sixty-Shift Unassisted Stability):** The deputies' lines sustain 60 consecutive unassisted shifts with line efficiency above 75 percent, FPY at or above 95 percent, and mechanic MTTR below 18 minutes (illustrative threshold). [S31] [S37] [S38]
- **Verification Gate 3 (Zero Black-Box Audit):** A randomly chosen local technician executes a full changeover, servo reset, and weekly PMS consolidation using only the open System of Record (illustrative check).

> **GFT NOTE**
>
> **Practical recommendation on mentor contracting** Never hire foreign floor supervisors on standard open-ended employment contracts and informally ask them to train local staff. [S09] [S1103] Contract every foreign practitioner as a *Fixed-Term Master Trainer and Commissioning Specialist* (12 to 18 months), name their three Cameroonian shadow deputies in the contract annex, and tie the 30 percent escrow payout directly to the deputies' 60-shift solo performance log in the PMS Excel pack (illustrative GFT standard).

WORKED EXAMPLE

Five-year supervisory payroll arithmetic: Permanent expatriates against GFT's seeded mentor cohort

Compare illustrative five-year (60-month) payroll costs for the 60 core supervisory and technical posts (36 supervisors, 24 mechanics/IE technicians) in GFT's 900-person, 3.0-million-garment Cameroon factory at an illustrative exchange rate of XAF 600 per US dollar (near the 655.957 XAF/EUR peg). [R32]

Model A: Conventional Permanent Expatriate Staffing

- Staffing 45 posts permanently with expatriates at an illustrative US$2,200/month fully loaded (XAF 1,320,000) and 15 junior posts with local assistants at US$200/month (XAF 120,000, ~2.7x the XAF 43,969 SMIG floor) costs $(45 \times \text{US\$2,200}) + (15 \times \text{US\$200}) = \text{US\$102,000}$ a month (XAF 61.2 million, illustrative calculation). [R14] [S09] [S10]
- Over 60 months, Model A consumes $\text{US\$102,000} \times 60 = \text{US\$6,120,000}$ (XAF 3.672 billion), or **US$0.453 per garment** across 13.5 million cumulative garments, while perpetuating floor language friction. [S10] [S24]

Model B: GFT Seeded Mentor Cohort and Promote-From-Within Ladder

- Hiring **8 master mentors** for an average 14-month tenure at US$2,200/month (70% retainer, 30% escrow) costs $8 \times 14 \times \text{US\$2,200} = \text{US\$246,400}$ (XAF 147.8 million, illustrative calculation).
- Ramping **60 local Cameroonian supervisors and technicians** across Bands 3 and 4 at an illustrative blended fully loaded cost of US$260/month (XAF 156,000, 3.55x SMIG and approaching the US$359 national average as superintendents step up) across Year 1 (averaging 38 active deputies) and Years 2 to 5 (60 posts) costs $(38 \times 12 \times \text{US\$260}) + (60 \times 48 \times \text{US\$260}) = \text{US\$867,360}$ (XAF 520.4 million, illustrative calculation). [R14] [R15]
- Adding US$53,600 in net Vestibule Dojo tooling and pre-launch stipends after PADESCE vouchers (Chapter 13) yields a five-year outlay of $\text{US\$867,360} + \text{US\$246,400} + \text{US\$53,600} = \text{US\$1,167,360}$ (XAF 700.4 million), or **US$0.086 per garment**. [S18]

Decision Consequence: Model B saves **US$4,952,640 (XAF 2.97 billion)** over five years, cutting supervisory overhead by **80.9 percent** (from US$0.453 to US$0.086 per garment) while paying Cameroonian leaders 3.55 times the minimum wage and localising 100 percent of floor leadership by Month 18 (illustrative result). [R14] [S09] [S10]

WARNING

Unresolved operational risk: Mid-ramp poaching of certified Cohort 1 supervisors
As large textile ventures such as the US$300 million (180 billion XAF) Camtext SA project scale toward 12,000 jobs at Dibamba and 3,000 at Garoua by 2033, rivals may try to poach GFT's Cohort 1 supervisors at Month 12. [R09] [R10] GFT counters this via a 15 percent cohort over-training buffer (86 trainees for 64 posts), a 24-month deferred Retention Tranche (Chapter 12), and the Step 2 Assistant Line Leader bench rule so every line has a certified deputy ready to step up on the same shift (illustrative mitigation). [S36]

11.17

How localised floor leaders sustain the Performance-Management System and Digital Strategy

Localising the supervisory spine is the precondition that makes GFT's second and third programme deliverables work (illustrative programme synthesis). In Deliverable 2 (Performance-Management System Design), the factory's rhythm rests on five manual logs filled at the point and time of work and reviewed in daily 10-to-15-minute huddles, weekly 45-to-60-minute reviews, and monthly S&OP sessions. Unlike a transient expatriate, a Cameroonian woman promoted from the sewing line through the Vestibule Dojo to Certified Line Supervisor owns the hour-by-hour board, the ILUO Skill Matrix, and the Excel Line Log as the instruments of her own career authority and bonus earnings. [S01] [S09] [S23] [S36]

In Deliverable 3 (Digital Strategy), Tier-1 machine-learning demand forecasting (cutting forecast errors 20 to 50 percent and inventory costs 35 to 40 percent at scale) and Tier-2 optimisation cannot switch on in Phase 2 unless Phase 1 accumulates 6 to 12 months of clean line and quality records. [R27] Training local leaders to record standardized D01 to D40 defect codes, exact MTTR minutes, and validated SAM efficiencies from Shift 1 weaves human capability and digital readiness into one system. [R29] [S31] [S38] Chapter 12 now details the SMIG-compliant pay bands, yield-gated bonuses, and safety controls that retain this localised workforce.

Foreign mentors should leave a factory not with a gap on the org chart, but with their knowledge woven into local hands and open logs.

CHAPTER SOURCE NOTES

S09 Open African Innovation Research (OpenAIR). 2021-02-17.

S13 SOAS University of London (IDCEA Project). 2018.

S24 World Bank. 2012.

S06 International Labour Organization (ILO). 2019-08-26.

S31 Hawassa University (Ethiopian Journal of Engineering and Technology). 2023.

S20 ILO and IFC Better Work. 2016-09.

S22 Better Work (ILO and IFC). 2018.

S08 International Labour Organization (ILO). 2019-08-26.

S01 University of Warwick Department of Economics (RePEc). 2015.

S36 Online Clothing Study. 2012-03-03.

S10 Open African Innovation Research (OpenAIR). 2021-02-17.

S11 Roskilde University Centre for African Economies (CAE). 2017.

R14 WageIndicator. Publication date unrecorded; inherited source-text check.

S1103 Open African Innovation Research (OpenAIR). 2021-02-17.

S04 National Bureau of Economic Research (NBER). 2019-05.

S38 IBM. 2024.

S39 TextileSchool. 2025.

S32 arXiv / City University of Hong Kong. 2025-02.

R29 MDPI; industry inspection literature. Publication date unrecorded; inherited source-text check.

S35 Online Clothing Study. 2019.

S37 Fibre2Fashion. 2013.

S42 International Labour Organization (ILO). 2020.

S21 International Labour Organization (ILO). 2024.

S1101 Innovations for Poverty Action (IPA). 2020-07-01.

S1102 International Growth Centre (IGC). 2015.

S02 National University of Singapore Department of Economics (STITCH). 2021-10.

S03 National University of Singapore Department of Economics (STITCH). 2021-10.

S23 International Labour Organization (ILO). 2016-09-26.

S40 International Labour Organization (ILO). 2022.

S27 American Economic Association (AEJ: Applied Economics). 2018-07.

R15 wage.is. Publication date unrecorded; inherited source-text check.

S18 World Bank (International Development Association). 2020-07.

R16 WageIndicator. Publication date unrecorded; inherited source-text check.

R03 SODECOTON. Publication date unrecorded; inherited source-text check.

S33 AllAfrica / Inter Press Service. 2026-09-03.

S14 World Bank and International Finance Corporation (IFC). 2021-12.

R32 Wise; XE. Publication date unrecorded; inherited source-text check.

R09 Ecofin Agency. Publication date unrecorded; inherited source-text check.

R10 Ecofin Agency. Publication date unrecorded; inherited source-text check.

R27 McKinsey, The State of Fashion 2025. Publication date unrecorded; inherited source-text check.

12

SMIG-Compliant Banded Pay and Yield-Gated Bonuses Align Speed With Quality

Paying operators raw piece rates buys speed at the expense of ruined garments, whereas flat minimum wages invite apathy; GFT structures five SMIG-compliant pay bands topped by yield-gated incentives that reward Right-First-Time output.

CHAPTER 12
DECISION TEST

Paying operators raw piece rates buys speed at the expense of ruined garments, whereas flat minimum wages invite apathy; GFT structures five SMIG-compliant pay bands topped by yield-gated incentives that reward Right-First-Time output.

A greenfield garment factory in Cameroon converts its nominal statutory wage advantage into durable unit-cost competitiveness only when its compensation architecture decouples basic livelihood security from raw piece-rate rushing and gates every variable bonus on verified first-pass quality. [R14] Across developing-country apparel hubs, plant sponsors routinely fall into one of two compensation traps: either paying flat statutory minimum wages that offer zero reward for skill upgrading, or imposing unguarded piece-rate quotas that drive operators to sew over defects, hoard simple tasks and quit when upstream bundle flow falters. [S24] In Green Future Tech's Cameroon textile programme, compensation, occupational safety and continuous improvement are engineered as a single closed loop anchored on Cameroon's statutory minimum wage (Salaire Minimum Interprofessionnel Garanti, or SMIG) of XAF 43,969 a month (about US$76 as of February 2024). [R14] Five transparent base-pay bands link objective skill-matrix certification to internal promotion from trainee operator to shift superintendent, while a mathematically gated incentive formula pays variable bonuses only when line First-Pass Yield (FPY) clears strict monthly thresholds. [S36] Combined with transport, nutrition and twenty-four-month retention tranches that compress annual attrition from a 45 percent baseline toward an illustrative 15 percent target, and shop-floor ergonomics aligned with the International Labour Organization (ILO) Code of Practice, this remuneration system protects both worker earnings and garment margin. [S27] All wage bands, social-security figures and bonus simulations in this chapter are operational engineering estimates and do not constitute legal, tax or investment advice.

12.1

Statutory labour compliance in Cameroon anchors payroll on the XAF 43,969 floor and working-time rules

Every payroll model, incentive table and unit-economics projection in GFT's Cameroon textile programme begins with unconditional compliance with national labour law and social-insurance statutes. [R14] Effective 23 February 2024, Cameroon raised its cross-sector statutory monthly minimum wage (SMIG) by 5 percent from XAF 41,875 in 2023 to XAF 43,969 a month, equivalent to approximately US$76 per month. [R14] Because the Central African CFA franc (XAF) is pegged to the euro at 655.957 XAF per euro, the currency traded near 590 to 610 XAF per US dollar across the 2023 study window and near 563 to 577 XAF per US dollar in subsequent refreshes, meaning all US dollar conversions in GFT's templates are treated as explicit estimates. [R32] Cameroon's XAF 43,969 monthly floor stands at roughly 37 percent of Cambodia's 2024 garment-sector minimum wage of US$204 a month and roughly 21 percent of Cameroon's cross-sector average salary of about US$359 a month, yet firm-level studies across Sub-Saharan Africa prove that a low statutory floor yields low unit labour cost per garment only when shop-floor supervision and structured pay hold capacity utilisation and efficiency on target. [R15]

Statutory working-time rules in Cameroon establish a standard 40-hour working week across industrial enterprises, subject to a 48-hour maximum and a mandatory overtime premium starting at 1.2 times the base hourly wage. [R16] Across a five-day, eight-hour shift pattern, a 40-hour week equals 173.33 standard paid hours per month, placing the statutory base hourly rate at an estimated XAF 253.67 per hour

(about US$0.42 to US$0.45 per hour) at the XAF 43,969 floor. [R14] When lines lose pace during morning start-ups or suffer rework bottlenecks and must run overtime up to the 48-hour ceiling, those hours are compensated at a minimum of 1.2 times the base rate (an estimated XAF 304.40 per hour). [R16] In GFT's Performance-Management System (Deliverable 2), the line supervisor's ability to bring operators to daily target nearly 15 minutes faster per shift directly eliminates chronic overtime drift at the 1.2x multiplier. [S20]

Formal industrial employers in Cameroon must also remit statutory social-security contributions to the National Social Insurance Fund (Caisse Nationale de Prevoyance Sociale, or CNPS, also a shareholder alongside SODECOTON in the US$300 million Camtext SA venture launched in November 2025) and parallel payroll levies. [R09] Under Cameroon's payroll framework, the employer pays four core monthly levies on gross wages: 7.0 percent for family allowances and 4.2 percent for old-age, invalidity and death pensions to the CNPS on gross monthly pay up to a ceiling of XAF 750,000 a month (XAF 9,000,000 a year), plus 1.5 percent to the housing fund (Credit Foncier) and 1.0 percent to the National Employment Fund (FNE), totalling 13.7 percent of gross pay before work-accident insurance. [S1202] On top of that 13.7 percent baseline, the employer pays 100 percent of the CNPS occupational risk levy, set at 1.75 percent for Group A low-risk operations, 2.5 percent for Group B medium-risk industrial operations, or 5.0 percent for Group C high-risk operations. [S1202]

Budgeting Group B occupational risk coverage at 2.5 percent alongside the 13.7 percent core levy and statutory paid leave accrual (1.5 working days per month, or roughly 6.0 percent of working days) adds an estimated 16.2 percent in direct cash levies and 22.2 percent including leave accrual on top of gross base wages. [S1202] At the Band 1 SMIG base of XAF 43,969 a month, the 16.2 percent employer statutory levy adds an estimated XAF 7,123 a month, bringing the guaranteed pre-bonus statutory employer cost of an entry operator to an estimated XAF 51,092 a month (about US$85 to US$90 at 570 to 600 XAF per US dollar). [R14] Employee deductions (4.2 percent CNPS pension, 1.0 percent Credit Foncier and personal income tax) are withheld from gross pay without increasing employer cost, and the Cost Inputs sheet in GFT's Excel pack stores the XAF 43,969 floor, 1.2x overtime multiplier and 16.2 percent levy so daily labour logs reconcile with the general ledger. [S1202]

12.2

Five SMIG-compliant pay bands link skill certification to internal promotion

A garment factory where 89.5 percent of the surrounding national workforce operates in the informal economy cannot retain ambitious operators or recruit technical graduates if everyone is compressed into a flat minimum-wage tier. [S42] In Ethiopian industrial parks, when entry-level factory pay barely covered urban transport and rent and offered no progression path, recruits quit within months, whereas relying on imported foreign supervisors and mechanics at US$1,500 to US$3,500 a month cripples plant overhead. [S10] Section 9 of GFT's Cameroon Feasibility Study resolves this tension through five SMIG-compliant monthly pay bands anchored as multiples of the XAF 43,969 floor and aligned with the ILO occupational benchmark for African

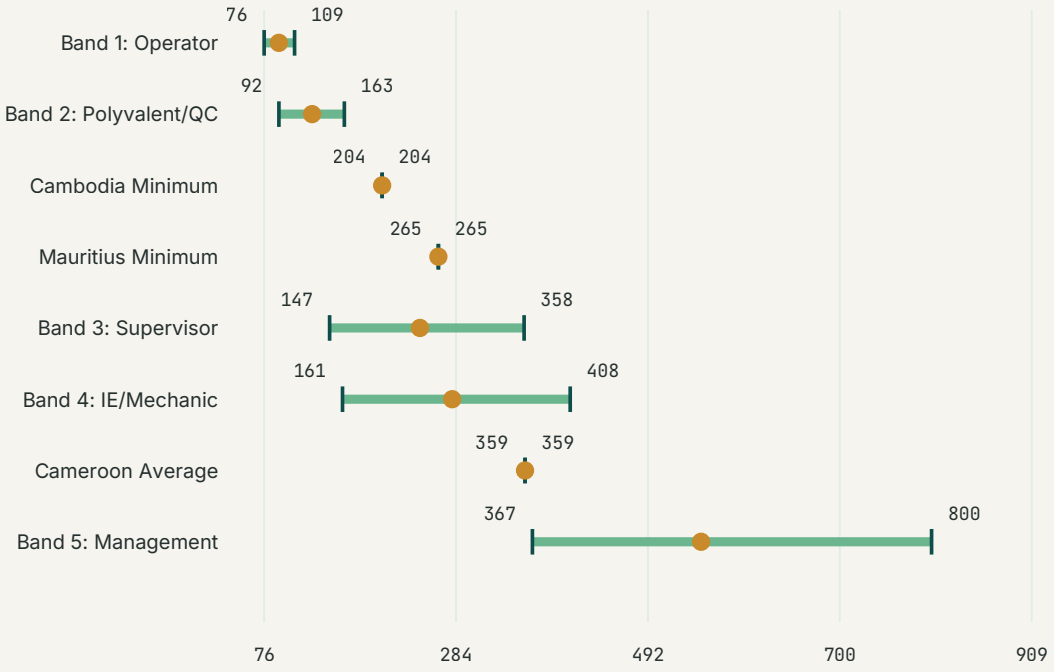
garment firms (4.4 percent managers, 8.7 percent technicians, 45.9 percent skilled operators, 20.3 percent unskilled operators and 16.3 percent non-production staff): [S08]

1. **Band 1 (Floor: Entry Operators, Helpers and Vestibule Trainees, 1.00x to 1.15x SMIG Base):** Covers vestibule trainees during their four-week Analytical Method of Training (AMT) cycle, bundle handlers and single-operation operators at ILUO Level I or entry Level L. [S35] Base monthly pay starts at the XAF 43,969 (US$76) floor during induction and rises to an illustrative XAF 50,500 (US$84) after Week 4 dojo certification, reaching an illustrative XAF 48,400 to XAF 65,600 (US$81 to US$109) with yield bonuses. [R14]
2. **Band 2 (Above Floor: Skilled Polyvalent Operators, Cutters and Quality Inspectors, 1.25x to 1.65x SMIG Base):** Covers Grade-A operators certified at ILUO Level U across at least three operations and two machine types under GFT's 3-by-3 Polyvalence Rule, cutters, inline Traffic Light System (TLS) inspectors and end-of-line vision operators. [S36] Base pay spans an illustrative XAF 55,000 to XAF 72,500 (US$92 to US$121), reaching an illustrative XAF 68,000 to XAF 98,000 a month (US$113 to US$163) with yield and polyvalence bonuses. [R14]
3. **Band 3 (Supervisory: Assistant Line Leaders, Line Supervisors and Shift Superintendents, 2.00x to 3.80x SMIG Base):** Covers the 36 shop-floor leaders across the 20 sewing lines: 12 Assistant Line Leaders (ILUO Level O coaches), 20 Certified Line Supervisors and 4 Shift Superintendents. [S20] Base pay spans an illustrative XAF 88,000 to XAF 167,000 (US$147 to US$278), reaching an illustrative XAF 110,000 to XAF 215,000 a month (US$183 to US$358) with line KPI bonuses, approaching Cameroon's US$359 cross-sector average salary. [R15]
4. **Band 4 (Technical: Sewing-Machine Mechanics, IE Work-Study Technicians and Senior QA/Vision Leads, 2.20x to 4.40x SMIG Base):** Covers the 24 industrial technicians (12 sewing-machine mechanics and 12 Industrial Engineering technicians) plus 4 senior AQL and vision leads. [S31] Recruited from MINESUP (BTS/DUT) and MINEFOP (DTS) programmes or Recognition of Prior Learning, Band 4 specialists earn an illustrative base of XAF 96,700 to XAF 193,500 a month (US$161 to US$323), reaching an illustrative XAF 120,000 to XAF 245,000 a month (US$200 to US$408) with MTTR and line-balance bonuses. [S42]
5. **Band 5 (Plant and Functional Management, 5.00x to 10.00x+ SMIG Base):** Covers the 30 senior plant management, HR, finance, sourcing, sales and chief engineering posts, spanning an illustrative XAF 220,000 to XAF 480,000 a month (US$367 to US$800). [R15]

The strategic logic of this five-band staircase is visible in **Exhibit 48**, p. 184, which plots GFT's base and total monthly cash ranges in US dollars against statutory and cross-sector benchmarks in Cameroon, Cambodia and Mauritius. [R17]

EXHIBIT 48 / US DOLLARS PER MONTH (BASE FLOOR TO BONUS CEILING)

Five SMIG-compliant pay bands reward skill progression while keeping supervisory costs below Asian and expatriate benchmarks



DERIVED [R14] [R15] [R17] [R32] [S14] Derived and illustrative GFT Cameroon compensation bands converted at an illustrative 600 XAF/USD reference rate (R32). Anchored on Cameroon SMIG floor of XAF 43,969 / ~US$76 (R14), Cambodia garment minimum US$204 (R17), Mauritius post-2018 minimum US$264.60 (S14) and Cameroon cross-sector average US$359 (R15).

As **Exhibit 48**, p. 184 demonstrates, even when a Band 2 polyvalent operator earns an illustrative US$128 midpoint a month (including yield and multi-skill bonuses), her total cash pay remains 37 percent below Cambodia's statutory entry floor of US$204 a month and 52 percent below Mauritius's US$264.60 textile floor. [R17] Meanwhile, a Band 3 Cameroonian line supervisor or Band 4 mechanic earning an illustrative US$245 to US$280 midpoint commands three to five times the entry SMIG floor while costing roughly one-eighth of an imported expatriate supervisor at US$2,200 a month. [S10] Note that **Exhibit 48**, p. 184 depicts gross cash pay before the 16.2 percent employer CNPS and payroll levy and cannot by itself guarantee low unit cost per garment unless paired with the line-efficiency and first-pass-yield gates below. [S1202]

Progression between steps inside each band follows verified capability in the People Log Skill Matrix rather than seniority or patronage. [S36] Econometric research from the National University of Singapore STITCH evaluation shows that when middle managers rely on subjective impressions to allocate training or rewards, they overlook lower-ranked supervisors whose lines gain more than 11 percent in productivity once trained. [S03] Similarly, field experiments in Bangladesh show that biased beliefs against female leadership leave women holding only 5 percent of supervisor roles despite making up 80 percent of sewing operators. [S01] Tying step increases from

Band 1 to Band 3 directly to blind vestibule diagnostic trials and recorded ILUO efficiency grades ensures that female and male operators advance on identical, auditable criteria. [S01]

12.3

Unguarded piece-rate incentives fail on a greenfield garment floor

In traditional garment hubs, factory owners often attempt to force operator speed by paying straight piece rates (per bundle sewn) or aggressive partial piece rates (a low base salary plus a bonus triggered only above a high daily quota). [S1201] Empirical research by the ILO and IFC Better Work programme across roughly 6,000 garment workers in Vietnam, Indonesia, Jordan, Haiti and Nicaragua reveals that poorly designed piece-rate systems harm both worker health and product quality. [S1201] In Better Work Discussion Paper 28, workers paid under partial piece-rate threshold systems reported significantly poorer physical and emotional health, higher anxiety over workplace injuries, and higher incidence of verbal abuse and harassment than workers paid on transparent time-based structures. [S1201]

On a greenfield African garment floor where 89.5 to 90.0 percent of recruits come from informal agriculture or petty trade and lack prior factory conditioning, unguarded piece-rate incentives fail through three engineering mechanisms: [S42]

- **Speed-over-quality gaming and rework cascades:** When daily take-home pay depends solely on bundle tickets clipped, operators rush seams and push skipped stitches, broken threads or 4-millimetre seam puckering downstream to clear volume quotas. [S37] Because manual inspection is only 60 to 70 percent accurate and misses 20 to 30 percent of defects, rushed piece-rate bundles either leak defects to customers or flood End-of-Line (EOL) rework tables, where unpicking and re-sewing consumes three to five times the original Standard Allowed Minutes (SAM). [R29]
- **Operation hoarding and refusal to cross-train:** Modern cut-make-trim lines must execute style changeovers and daily morning rebalancing to cover 4 to 9 percent absenteeism. [S04] Under straight piece rates, an operator who has mastered a simple lockstitch hem resists reassignment to a complex placket set or afternoon polyvalence training because any learning-curve dip cuts her daily piece earnings, paralysing dynamic shock reallocation. [S04]
- **Earnings volatility and early walkouts:** On a 30-to-41-station progressive bundle line, an operator's output is constrained by upstream stations and machine reliability. [S31] When line imbalances, shade-lot delays or a 30-minute looper repair starve downstream stations, piece-rate operators lose earnings through no fault of their own, triggering floor disputes and the early quitting waves documented in Ethiopian and Lao PDR studies. [S24]

Section 6 of GFT's Performance-Management System Design therefore prohibits unguarded piece rates. Every worker's guaranteed base pay sits at or above the XAF 43,969 monthly SMIG floor regardless of upstream delays, providing the predictable

monthly income floor that Ethiopian experimental studies showed workers require to stay in industrial jobs, while variable bonuses reward only verified Right-First-Time output. [R14]

12.4

Mathematical specification of GFT's Yield-Gated Line and Individual Bonus

To align individual operator speed, multi-station teamwork and source-level quality control on a single set of rules, GFT engineers a composite monthly variable bonus formula that couples individual efficiency with whole-line output and multiplies the sum by a hard Quality and Attendance Gate. [S20]

METHOD

System boundary and calculation rules for the GFT Yield-Gated Bonus (illustrative GFT Performance-Management System specification):

1. **Guaranteed Statutory Floor (`B_i`):** Every worker `i` receives 100 percent of their contracted monthly Band base salary `B_i ⩾ XAF 43,969` for standard attended hours, plus statutory 1.2x overtime pay for authorised hours between 40 and 48 hours per week. [R14]
2. **Individual Efficiency Score (`E_ind,i`):** Calculated monthly from the Line Log as total Standard Allowed Minutes earned on good bundles divided by attended station minutes: `E_ind,i = Sum(Good Pieces_i,k * SAM_k) / Minutes Attended_i`, opening at `E_min = 65 percent` and scaling at 1.0 percent of base pay per 1.0 point above 65 percent (illustrative GFT model). [S31]
3. **Line Team Efficiency Score (`E_line`):** Calculated for the entire sewing line as good finished garments multiplied by garment SAM, divided by total line operator minutes attended, using the same slope above 65 percent. [S31]
4. **Weighted Efficiency Pool (`P_i`):** Combines individual effort (60 percent weight) with line teamwork (40 percent weight): `P_i = 0.60 * max(0, E_ind,i - 0.65) + 0.40 * max(0, E_line - 0.65)` (illustrative GFT weighting based on NBER reallocation evidence). [S04]
5. **Hard Line First-Pass Yield Gate (`G_FPY`):** For line First-Pass Yield `FPY_line`, the gate multiplier in GFT's illustrative PMS model is a four-step function: below 90.0 percent `FPY_line`, `G_FPY = 0.00` (Gate Closed); from 90.0 to 92.9 percent, `G_FPY = 0.50` (Half Gate); from 93.0 to 95.9 percent, `G_FPY = 1.00` (Full Gate); and at 96.0 percent or above, `G_FPY = 1.25` (Excellence Accelerator). [S37]
6. **Individual Traffic Light System and Attendance Gate (`G_TLS,i`):** If operator `i` receives a Red TLS card and bypasses stop-and-fix quarantine, or records more than one unexcused absence day in the month, `G_TLS,i` drops from `1.00` to `0.50` on the first occurrence and `0.00` on the second. [S37]
7. **Final Monthly Operator Payout (`W_i`):** `W_i = B_i * [1 + (P_i * G_FPY * G_TLS,i)] + Polyvalence Allowance_i + Overtime_i` (illustrative GFT formula).

The behavioural impact of this multiplicative gate across the sewing floor is illustrated in **Exhibit 49**, p. 187, which maps the final bonus payout (as a percentage of monthly base salary B_i) across seven levels of line efficiency (from 65 percent to 95 percent) and four First-Pass Yield tiers. [S37]

EXHIBIT 49 / BONUS PAYOUT AS PERCENT OF MONTHLY BASE WAGE

The First-Pass Yield gate zeroes out speed bonuses below 90 percent yield and accelerates payouts above 96 percent yield

	65% Eff	70% Eff	75% Eff	80% Eff	85% Eff	90% Eff	95% Eff
FPY < 90% (Closed 0.0x)	0	0	0	0	0	0	0
FPY 90-92.9% (Half 0.5x)	0	2.5	5	7.5	10	12.5	15
FPY 93-95.9% (Full 1.0x)	0	5	10	15	20	25	30
FPY >= 96% (Boost 1.25x)	0	6.25	12.5	18.8	25	31.2	37.5

Cell scale: 0 to 37.5

ILLUSTRATIVE [R14] [S37] Illustrative GFT Performance-Management System (Deliverable 2 Section 6) payout matrix for an operator whose individual efficiency matches line efficiency above the 65 percent threshold, gated by First-Pass Yield (FPY) and inline Traffic Light System (TLS) compliance (S37) on top of the XAF 43,969 SMIG floor (R14).

Inspecting **Exhibit 49**, p. 187 reveals why speed-over-quality gaming disappears under GFT's rules. [S37] If a sewing line rushes bundles to hit 90 percent efficiency by ignoring stitch tension, dropping First-Pass Yield to 87 percent (Row 1 of **Exhibit 49**, p. 187), the quality gate closes to 0.0x and the line receives 0.0 percent variable bonus above the SMIG base. [R14] By contrast, a disciplined line running at 80 percent efficiency while maintaining 96.2 percent First-Pass Yield through Traffic Light System patrols and edge-vision checks (Row 4, Column 4) earns an 18.75 percent bonus on top of base pay, and at 90 percent efficiency earns a 31.25 percent bonus. [R29] Because **Exhibit 49**, p. 187 cannot by itself separate sewing faults from incoming fabric flaws, GFT's Quality Lead logs fabric defects caught at the 60-metre-per-minute line-scan camera separately from sewing-line DHU so operators are judged strictly on station defects under their control. [R29]

For Band 3 Line Supervisors, Band 4 Industrial Engineering Technicians and Band 4 Sewing-Machine Mechanics, monthly variable pay (targeted at an illustrative 15 to 30 percent of base salary) is governed by their five controllable numbers in GFT's Performance-Management System: [S20]

- **Line Supervisor Bonus Scorecard (Band 3):** Line Efficiency against SAM (30 percent weight, target above 75 percent in Phase 2 and above 85 percent in Phase 3), Line FPY and DHU (30 percent weight, gated at FPY ⩾ 93 percent), On-Time-

In-Full bundle completion (15 percent), 3-by-3 Skill-Matrix Coverage (15 percent, target at least 85 percent), and Daily Line Log and Huddle CAPA closure (10 percent). [S31]

- **Sewing-Machine Mechanic Bonus Scorecard (Band 4):** Zone Machine Availability (35 percent weight, target at least 94 percent), Mean Time to Repair (30 percent, target MTTR below 18 minutes on standard heads and below 45 minutes on specialty machines), Preventive Maintenance 500-hour schedule compliance (20 percent, 100 percent on time), and zero repeat breakdowns or oil-stain Red TLS cards within 48 hours of service (15 percent). [S38]
- **IE Work-Study Technician Bonus Scorecard (Band 4):** Line Balance Efficiency on assigned lines (35 percent weight, target at least 85.9 percent via Ranked Positional Weight or Kilbridge-Wester heuristics), Style-Changeover Ramp Time (25 percent, hitting 75 percent efficiency within three shifts), Method-Engineering SAM reductions via folders and jigs (20 percent), and Monthly Skill-Matrix audit accuracy in the Excel pack (20 percent). [S31]

WORKED EXAMPLE

Comparative monthly payroll and unit-labour-cost arithmetic for two 32-operator sewing lines (illustrative GFT calculation):

Consider two parallel 32-operator sewing lines (Line A and Line B) assembling a cotton crew-neck T-shirt (`SAM = 4.20 standard minutes`) over a 173.33-hour statutory working month in Cameroon (332,800 total operator minutes per line). [R16] Each line is staffed by 24 Band 1 operators at the XAF 43,969 SMIG base and 8 Band 2 polyvalent operators at an illustrative XAF 58,000 base, overseen by 1 Band 3 Line Supervisor (XAF 125,000 base) and 1 Band 3 Assistant Line Leader (XAF 92,000 base), for a monthly base payroll of `XAF 1,736,256` before employer levies. [R14]

- **Line A (Rushed Volume, Low Quality):** Line A pushes raw speed to 85.0 percent gross sewing rate (67,352 gross T-shirts), but First-Pass Yield drops to 86.0 percent (9,429 defective shirts). [S21] Re-sewing 7,400 repairable shirts diverts 62,160 operator minutes while 2,029 damaged shirts are downgraded to seconds, leaving **57,923 good First-Pass-equivalent garments**. [S37] Because `FPY = 86.0 percent < 90.0 percent`, the Quality Gate closes (`G_FPY = 0.00`), paying XAF 0 bonus. [R14] Adding the 16.2 percent statutory CNPS and payroll levy (XAF 281,273) gives a payroll of **XAF 2,017,529** (US$3,363 at 600 XAF/USD), plus an estimated XAF 1,217,400 (US$2,029) in lost fabric margin on the 2,029 seconds (illustrative estimate at US$1.00 fabric cost per shirt), bringing effective labour-and-rework cost to **XAF 55.85 (US$0.0931) per good T-shirt**. [R32]
- **Line B (Balanced Flow, Right First Time):** Line B runs at 80.0 percent net efficiency with **96.5 percent First-Pass Yield** and zero scrap, producing **63,390 good First-Pass T-shirts**. [S37] At 80.0 percent efficiency and `FPY = 96.5 percent ⩾ 96.0 percent` (`G_FPY = 1.25`), the team earns an **18.75 percent monthly yield-gated bonus** (**Exhibit 49**, `p. 187`), adding XAF 325,548 to gross pay (lifting Band 1 cash pay to XAF 52,213 and the Line Supervisor to XAF 148,438). [R14] Including the 16.2 percent statutory levy (XAF 334,012), Line B's total employer payroll is **XAF 2,395,816** (US$3,993). [S1202] Divided across 63,390 good garments, Line B's effective unit cost is **XAF 37.79 (US$0.0630) per good T-shirt**, saving **32.3 percent (XAF 18.06 per shirt)** against Line A while paying workers 18.75 percent higher take-home earnings (illustrative GFT calculation).

12.5

Retention engineering cuts annual attrition below eighteen percent and pays for itself twice over

Even a well-designed bonus formula fails if workers leave after four months. [S27] Empirical diagnostics across emerging-market garment hubs identify high turnover as the core driver of the low-equilibrium productivity trap: in World Bank Report 70809-LA on Lao PDR garment exporters, floor dissatisfaction and foreign supervisor friction drove chronic turnover that depressed capacity utilisation and deterred training investment. [S24] In Madagascar's apparel export zone (where 101 free-zone firms generated US$681 million in exports and 20 percent of formal employment), 45 percent of companies reported skill deficits while high turnover discouraged training out-

lays. [S14] In Ethiopia, experimental tracking showed that most industrial recruits quit within months, and that a US$300 grant with business training enabled self-employed workers to earn 33 percent more with steadier hours than entry-level factory workers. [S27]

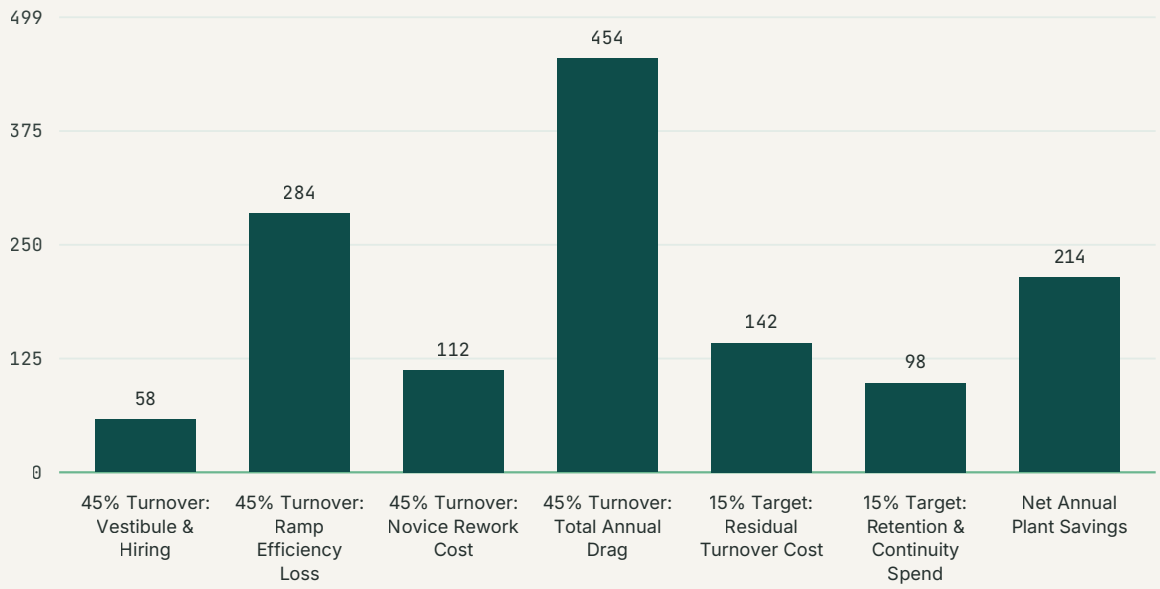
When a 900-person factory experiences a 45 percent annual turnover rate, losing 324 of 720 direct operators and 27 of 60 supervisors and technicians each year forces the Vestibule Training Dojo to run purely to replace leavers. [S06] Every departing operator consumes four weeks of paid vestibule stipends (XAF 43,969 base plus 16.2 percent levies, or an estimated XAF 51,092), instructor time and eight weeks of on-line learning-curve drag, while losing a certified Band 3 supervisor or Band 4 mechanic disrupts the 1-to-3 mentorship handoff. [R14] To compress annual operator turnover from 45 percent to an illustrative target of 15 percent (and specialist turnover below 8 percent), GFT embeds three retention anchors into the compensation package:

1. **Quarterly Attendance and Continuity Bonus:** Workers who complete a 13-week quarter with zero unexcused absences earn a lump-sum payment equal to 25 percent of one month's base salary (an estimated XAF 10,992 per quarter, or XAF 43,969 per year, for Band 1), smoothing household school-fee and rent needs. [R14]
2. **Subsidised Staff Transport Shuttles and Hot Midday Nutrition:** Because spending 20 to 30 percent of wages on transport and skipping midday meals causes afternoon fatigue and defect spikes, GFT contracts staff buses in Douala-Dibamba or Garoua and provides a hot midday canteen meal at an illustrative cost of XAF 600 per shift (XAF 13,000 or US$21.67 per worker per month), preserving cash pay for household savings. [S23]
3. **Twenty-Four-Month Supervisory and Technician Certification Retention Tranche:** To counter poaching as Camtext SA scales toward 12,000 jobs at Dibamba and 3,000 at Garoua by 2033, GFT accredits its 16-week boot camps under MINEFOP's Competency-Based Approach (CBT) and World Bank PADESCE vouchers so graduates earn national DQP or DTS credentials paired with a retention tranche. [R10] Accruing an illustrative XAF 25,000 (US$41.67) per month of certified Band 3/4 service pays out XAF 300,000 (US$500) at Month 12 and XAF 300,000 (US$500) at Month 24. [S17]

The net financial return of this retention package for an illustrative 900-person factory (720 operators and 60 supervisors/technicians) is quantified in **Exhibit 50**, p. 191. [S24]

EXHIBIT 50 / THOUSAND US DOLLARS PER YEAR

Cutting annual turnover from 45 percent to 15 percent saves an estimated US$312,000 a year in replacement and efficiency losses



DERIVED [R14] [R32] [S06] [S20] [S24] [S27] Derived GFT retention-economics model for 720 operators and 60 supervisors/technicians converted at 600 XAF/USD (R32). Compares 45% annual attrition baseline (324 operator + 27 specialist exits/yr, S06, S24, S27) against 15% operator / 8% specialist attrition under GFT's SST supervision (S20), quarterly continuity bonus (R14) and 24-month retention tranche.

As **Exhibit 50**, p. 191 shows, at a 45 percent turnover baseline (324 operator and 27 specialist exits a year), the plant loses an estimated US$58,000 in vestibule stipends and hiring, US$284,000 in eight-week ramp efficiency drag and US$112,000 in novice rework, totalling **US$454,000 (XAF 272.4 million) in annual turnover drag**. [R14] Compressing operator turnover to 15 percent and specialist turnover to 8 percent cuts turnover drag by US$312,000 to **US$142,000 a year**. [S20] Subtracting the **US$98,000 (XAF 58.8 million)** annual cost of the continuity bonuses and Band 3/4 retention tranches leaves a **net annual saving of US$214,000 (XAF 128.4 million)**, paying back the retention budget 3.1 times over. [R32] Note that **Exhibit 50**, p. 191 models steady-state Year 2 operations and requires strict Better Work SST communication discipline to hold attrition down. [S20]

12.6

Occupational safety and health controls operate as a shift-long speed and yield multiplier

An operator cannot sustain an 80 to 90 percent SAM pace and a sub-4.0 DHU quality rate across an eight-hour shift under back strain, eye glare, cotton-lint dust, heat stress or unguarded needle hazards. [S40] In October 2021 (published 2022), the ILO adopted the Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear, defining mandatory manager and supervisor OSH training in Chapter 14 and personal protective equipment (PPE) standards in Chapter 15. [S40] NBER Working Paper 25865 confirms that environmental shocks on the garment floor depress worker productivity immediately unless buffered by management, while ILO

SCORE and Better Work evaluations show that combining shop-floor safety and ergonomics with cooperative supervision lifts productivity by 15 to 22 percent and cuts rework by 12 percent. [S04]

GFT embeds the 2022 ILO Code of Practice into daily supervisory routines across six control domains, summarised in **Exhibit 51**, p. 192: [S40]

EXHIBIT 51 / STATUTORY AND OPERATIONAL CONTROL STANDARD

Shop-floor Occupational Safety and Health controls aligned with the 2022 ILO Code of Practice and GFT daily ownership

OSH Hazard Domain	Engineered Shop-Floor Control & PPE Standard	Productivity & Yield Mechanism	Audit Cadence & Owner
Mechanical & Cutting Guarding	Needle-bar finger guards, polycarbonate eye shields, V-belt covers; EN 1082 stainless-steel mesh gloves on straight/band knives (S40).	Eliminates needle-puncture and knife-amputation stops; enables confident high-speed fabric feeding.	Pre-shift 5-min check: Operator & Zone Mechanic
Workstation Ergonomics	Adjustable chairs with lumbar support, 15-deg pedal angle, table-height matching, gravity bundle chutes (S40).	Cuts handling waste (65-75% of cycle time) and prevents Hours 6-8 lower-back fatigue drop.	Style changeover & weekly: IE Technician
Task Lighting & Visual Acuity	500-lux needle-point LED task lamps; 1,000-lux daylight-balanced D65 booths at inline TLS and EOL vision tables (R29, S40).	Prevents eye strain; lifts human defect detection above the 60-70% manual baseline (R29).	Weekly lux-meter audit: QA Lead & Mechanic
Thermal & Cotton-Dust Control	Roof insulation, evaporative cross-ventilation (<28 C WBGT target), 5-min autonomous lint brushing & local extraction (S39, S40).	Buffers afternoon heat shocks (S04); prevents lint bird-nesting and respiratory absenteeism.	Twice-daily temp/lint log: Line Supervisor
Electrical, Fire & Needle Safety	AVR/UPS on direct-drive servos, residual-current breakers, unobstructed 1.5m aisles, 100% broken-needle fragment board (S40).	Prevents servo-board burnouts during grid dips and guarantees zero metal contamination in cartons.	Continuous shift gate: Supervisor & QA Lead
Hydration, Sanitation & Dignity	Cooled potable water within 25m, gender-segregated toilets (1:20 female ratio), zero verbal abuse protocol (S20, S24, S40).	Eliminates dehydration fatigue and fear-driven stitch errors on an 80% female floor (S20).	Daily huddle & monthly committee: HR & Supervisor

SOURCED [R29] [S20] [S24] [S39] [S40] Sourced from the ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear (wcms_828429, Chapters 14 and 15, S40), integrated with GFT maintenance (S39), inspection lighting (R29) and supervisory cadence (S20, S24).

Each row of **Exhibit 51**, p. 192 connects a requirement of the 2022 ILO Code of Practice to Overall Equipment Effectiveness (OEE) and First-Pass Yield. [S40] In Row 1 and Row 5, zone mechanics calibrate finger guards and eye shields on 4,500-stitch-per-

minute heads so they never obstruct feeding, cutting operators wear five-finger stainless-steel mesh gloves, and broken needles require 100 percent fragment accounting before replacement. [S40] In Row 2 and Row 3, because manual handling consumes 65 to 75 percent of sewing cycle time, adjustable swivel chairs, 15-degree pedal angles, tilted bundle stands and 500-lux needle LED lamps (paired with 1,000-lux D65 booths and 60-metre-per-minute edge computer-vision tables) prevent afternoon musculoskeletal slowdowns while lifting defect detection above 90 percent. [R29] In Row 4 and Row 6, evaporative cross-ventilation against Garoua's 38-degree-Celsius dry-season heat or Douala's humidity, cooled water within 25 metres, and clean gender-segregated sanitation for an 80 percent female operator workforce preserve stamina and dignity across the shift. [S33] Note that **Exhibit 51**, p. 192 supplements rather than replaces statutory CNPS and Ministry of Labour health-and-safety inspections. [S1202]

12.7

Fair consequence management and the Continuous Improvement (CAPA) engine

A performance-management system must also specify a fair, non-punitive consequence protocol when a station repeatedly misses hourly output or quality targets. [S20] In Section 6 of GFT's Performance-Management System Design, when the Line Log or Quality Log flags that a workstation has fallen below 65 percent SAM efficiency for three shifts or triggered two Red TLS cards in a week, the supervisor initiates a four-step Diagnostic Consequence Protocol before any disciplinary action: [S37]

1. **Step 1: Mechanical and Material Verification (Shift 1, Zone Mechanic and QA Rover):** Within 15 minutes, the mechanic checks rotary-hook timing, feed-dog height and thread tension while the QA rover checks incoming cut-panel notches and shade lots, resolving the roughly 50 percent of slumps caused by machine or cutting faults. [S39]
2. **Step 2: Work-Study and Ergonomic Audit (Shift 2, IE Technician):** If machine and cut panels pass, the IE technician times 10 cycles against GSD motion standards, adjusts folder guides or rebalances tasks exceeding the 33-second pitch ceiling via Ranked Positional Weight. [S31]
3. **Step 3: Off-Line Vestibule Skill Refresher (Shifts 3 to 5, Master Trainer):** Confirmed psycho-motor skill gaps rotate the operator into the 30-station Vestibule Dojo for two to three half-shift coaching sessions at full XAF 43,969 Band 1 base pay while a Band 2 polyvalent floater covers the line station. [R14]
4. **Step 4: Formal HR Performance Plan (Week 3+, HR Lead):** Only persistent refusal to follow standard procedures or safety rules after clearing Steps 1 to 3 moves to documented HR coaching under Cameroon's Labour Code. [R16]

GFT NOTE

Tie every incentive payout and consequence review to the same point-of-work Excel spine: Never run a separate shadow spreadsheet in the payroll office to calculate monthly yield bonuses or track disciplinary steps. In GFT's Performance-Management System (Deliverable 2 Section 4 and Section 6), the hourly good-piece counts entered by the line supervisor in `Line_Log`, defect codes and Red-card counts in `Quality_Log`, and attendance and ILUO grades in `People_Log` feed the monthly yield-gated bonus cells automatically. Because the numbers reviewed every morning at the 10-to-15-minute visual-board huddle determine month-end bonuses on the XAF 43,969 base, workers police floor data accuracy themselves and keep the historical store clean for Phase 2 forecasting. [R14]

Every Thursday afternoon, each line also holds a 30-minute Kaizen and CAPA review (modelled on ILO SCORE workshops that cut rework by 12 percent and Indian textile RCTs that raised productivity by 11 to 17 percent and annual profit by about US$230,000 per plant) to engineer out the week's top three Pareto defect causes. [S25]

WARNING

Unresolved risk: Perverse incentive gaming through unreported inline defects or hidden rework bundles Whenever a line's monthly bonus is gated on achieving `FPY ⩾ 93 percent`, a temptation arises for the supervisor and inline rover to under-report Red TLS cards or hide defective bundles. [S37] GFT blocks this collusion via a two-key audit: the 45 quality staff report vertically to the QA Manager rather than Production, and every finished bundle passes through the independent End-of-Line computer-vision booth (above 90 percent accuracy across more than 40 defect types). [R29] Any divergence between manual TLS logs and EOL computer-vision pass rates triggers a Plant Manager audit and zeroes the supervisor's data-governance bonus.

By binding Cameroon's XAF 43,969 statutory floor, five skill-certified pay bands, yield-gated team bonuses, retention anchors, ILO-compliant ergonomics and closed-loop CAPA problem-solving into one system, GFT turns compensation into the engine of shop-floor learning. [R14] Chapter 13 translates these role bands and retention rates into the cohort-funnel arithmetic and capital budget required to staff all 900 posts across the eighteen-month ramp.

A factory gets the pace it pays for and the quality it gates: guarantee the floor so workers can stay, and gate the bonus on yield so every fast seam is a good seam.

CHAPTER SOURCE NOTES

R14 WageIndicator. Publication date unrecorded; inherited source-text check.

S24 World Bank. 2012.

S36 Online Clothing Study. 2012-03-03.

S27 American Economic Association (AEJ: Applied Economics). 2018-07.

R32 Wise; XE. Publication date unrecorded; inherited source-text check.

R15 wage.is. Publication date unrecorded; inherited source-text check.

R16 WageIndicator. Publication date unrecorded; inherited source-text check.

S20 ILO and IFC Better Work. 2016-09.

R09 Ecofin Agency. Publication date unrecorded; inherited source-text check.

S1202 Teamed. 2026-10-21.

S42 International Labour Organization (ILO). 2020.

S10 Open African Innovation Research (OpenAIR). 2021-02-17.

S08 International Labour Organization (ILO). 2019-08-26.

S35 Online Clothing Study. 2019.

S31 Hawassa University (Ethiopian Journal of Engineering and Technology). 2023.

R17 just-style. Publication date unrecorded; inherited source-text check.

S14 World Bank and International Finance Corporation (IFC). 2021-12.

S03 National University of Singapore Department of Economics (STITCH). 2021-10.

S01 University of Warwick Department of Economics (RePEc). 2015.

S1201 ILO and IFC Better Work. 2018-12-20.

S37 Fibre2Fashion. 2013.

R29 MDPI; industry inspection literature. Publication date unrecorded; inherited source-text check.

S04 National Bureau of Economic Research (NBER). 2019-05.

S38 IBM. 2024.

S21 International Labour Organization (ILO). 2024.

S06 International Labour Organization (ILO). 2019-08-26.

S23 International Labour Organization (ILO). 2016-09-26.

R10 Ecofin Agency. Publication date unrecorded; inherited source-text check.

S17 Cameroon Ministry of Employment and Vocational Training (MINEFOP / JEME). 2025.

S40 International Labour Organization (ILO). 2022.

S39 TextileSchool. 2025.

S33 AllAfrica / Inter Press Service. 2026-09-03.

S25 National Bureau of Economic Research (NBER). 2011-01.

13

Cohort Funnel Arithmetic Sizes the Pipeline for a Nine-Hundred-Person Factory

An illustrative factory needs a dated flow of qualified people, funded training places and retained capability before its headcount can support its output promise.

CHAPTER 13
DECISION TEST

An illustrative factory needs a dated flow of qualified people, funded training places and retained capability before its headcount can support its output promise.

A factory should size its recruitment pipeline backwards from the qualified people required at each production release, then test whether training capacity, retention and cash can deliver them on time. For the illustrative nine-hundred-person factory examined here, a recruitment total alone is insufficient. The sponsor needs separate reconciliations for permanent posts, learners, mentors, graduates and people actually available for the required work. This chapter provides that arithmetic. Its factory configuration, conversion rates, budgets and production volumes are illustrative planning inputs, not an operating forecast or a claim about a GFT factory.

The method separates evidence about why capability matters from assumptions about how much capability this particular factory needs. The ILO's Ethiopian garment-sector assessment identifies recurring replacement training and occupational skills shortages as operational constraints. That supports keeping recruitment and learning capacity in the operating plan. It does not supply a Cameroonian screening rate, a universal supervisor ratio or a guaranteed training yield. [S1301]

13.1

The organisational pyramid must reconcile before recruitment begins

The illustrative full-ramp establishment contains 900 permanent posts. Direct production comprises 720: sewing employs 640 people, cutting and related preparation 35, and finishing and packing 45. The sewing allocation assumes 20 lines with 32 occupied operator stations each. These are design choices for a proposed cut-make-trim configuration; product complexity, shift coverage and equipment choices must still be engineered. The illustrative annual objective is 3.0 million accepted garments, conditional on a separate capacity calculation.

The remaining illustrative establishment comprises 36 line and shift supervisors, 24 industrial technicians, 45 quality and vision staff, 45 warehouse and production-support staff, and 30 management and administrative staff. These groups sum to 180 posts and close the establishment at 900. Within supervision, the assumed allocation is 20 line supervisors, 12 assistants and 4 shift superintendents. Within technicians, the assumption is 12 mechanics and 12 work-study, pattern or related technicians. Support roles require explicit task descriptions before approval.

Quality staff should include inspection, disposition and system stewardship appropriate to the actual process. A camera does not remove the need for someone to resolve a held batch, maintain reference samples or investigate disagreement between inspection methods. GFT recommends defining each quality post by its decision responsibility. Avoid declaring the whole group interchangeable with production operators when checking whether a particular line can open.

An Ethiopian occupational comparison in the ILO assessment reports managers at 4.4 percent, technicians at 8.7 percent, skilled production workers at 45.9 percent, unskilled production workers at 20.3 percent and non-production workers at 16.3 percent. These categories total 95.6 percent, leaving a reconciliation gap in the

reported classification. They are not identical to this chapter's role groups. They provide a reason to investigate coverage, not validation of the illustrative organogram. [S1301]

The illustrative leadership training track covers 64 eventual posts: the 36 supervisors, 24 technicians and 4 senior quality leads. Those quality leads are already included in the quality establishment. They must not be added again to total employment. The other 116 support and management posts require their own recruitment and induction arrangements. Their treatment outside the specialist training funnel does not mean that they arrive without selection costs or preparation.

Define the establishment as funded permanent positions, rather than every person who may enter the site. Keep a separate learner register and a separate temporary-mentor register. Someone may change status during the programme but should not occupy both categories on the same reporting date. Finance should reconcile these registers to paid engagements, while operations reconciles them to named duties. This prevents a training attendance list from becoming an inflated statement of productive readiness.

GFT recommends attaching a post identifier, role family, required competence, intended start date, cost centre and release authority to every establishment line. Recruitment should be authorised against an identified vacancy or a documented replacement requirement. Where a learner is being prepared for succession, record the intended handover and the incumbent's departure separately. Otherwise the apparent vacancy can disappear into a spreadsheet while the underlying duplication remains on payroll.

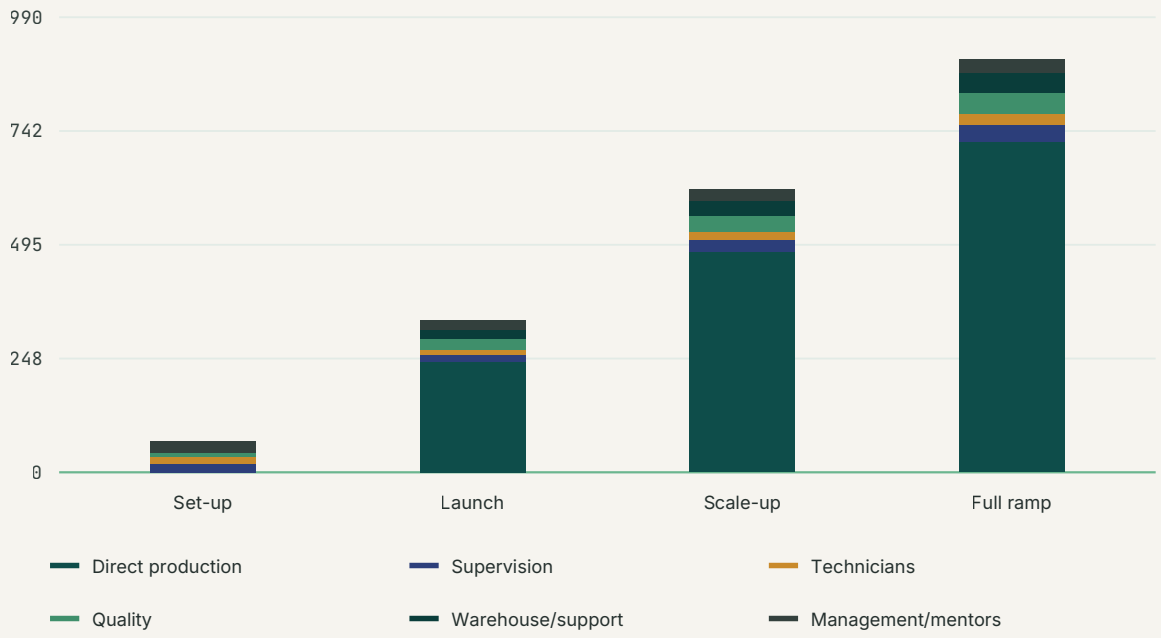
13.2

Payroll can follow a ramp only when its staffing boundary is explicit

The illustrative ramp in **Exhibit 52**, p. 199 uses four planning snapshots. Set-up carries 68 paid people, launch 330, scale-up 615 and full ramp 900. These are end-state snapshots, not average employment over each period. A payroll forecast must use individual start dates or monthly averages. Multiplying the final headcount by the duration of a phase would overstate its cost if recruitment occurs gradually and understate it if temporary overlap is omitted.

EXHIBIT 52 / ILLUSTRATIVE PAID PEOPLE AT EACH SNAPSHOT

Paid snapshots reconcile across the proposed ramp



ILLUSTRATIVE Illustrative assignments, not observed staffing. Totals are 68, 330, 615 and 900. Set-up includes learners; management includes temporary mentors until their departure. Columns are snapshots, not cumulative recruitment.

At illustrative set-up, the final group contains 8 mentors, 6 training or HR staff and 10 management or site-engineering staff. Together with 18 supervisor learners, 16 technician learners and 10 quality leads, this produces the 68-person snapshot. The later management totals include 8 mentors at launch and 4 during scale-up. Their eventual departure is built into the permanent establishment rather than presented as a reduction in locally required capability.

The illustrative launch allocation of 240 direct-production posts cannot fully occupy 8 sewing lines of 32 stations: sewing alone would require 256 people before cutting or finishing. Accordingly, the launch snapshot denotes partially staffed lines or a smaller number of complete lines. A plan may, for example, distribute 210 people to sewing and 15 each to preparation and finishing. The line-opening decision must follow the operation-level balance, not the advertised number of installed lines.

Likewise, the illustrative scale-up allocation of 480 direct people requires a documented split before claiming that 14 installed lines are fully staffed. The full-ramp allocation provides 640 sewing people across the proposed 20 lines, but it contains no additional sewing relief pool. Leave, absence, training release and deployment restrictions must therefore reduce available station time or be supported by separately budgeted coverage. A permanent-post total is not a daily attendance guarantee.

The illustrative output milestones of 1.0 million, 2.0 million and 3.0 million garments per year are annualised run-rate objectives. They are not actual production during launch, scale-up and full ramp. The capacity calculation must use style-specific

standard minutes, scheduled time, deployable skill, availability and accepted-output yield at consistent boundaries. Do not multiply a sewing efficiency already measured in good output by an additional quality factor covering the same loss.

> **GFT NOTE**
>
> Approve the payroll envelope and the production release separately. The first funds people and learning; the second requires verified competence, materials, equipment and accepted-output evidence. If either reconciliation fails, revise the release date and customer promise before increasing recruitment commitments.

13.3

Conditional transition rates expose the true recruitment requirement

The illustrative static funnel uses three conditional probabilities: screening acceptance among assessed applicants, graduation among inducted learners, and retention among graduates through a defined planning endpoint. Multiply these conditional rates only when the denominators and endpoint match. The product gives expected retained graduates per applicant. It does not mean that selection, graduation and retention are independent events. Each rate is conditional on reaching its preceding state.

For the illustrative leadership track, assume 88 percent graduation and 90 percent retained availability at the endpoint. An intake of 86 gives 86 multiplied by 0.88 multiplied by 0.90, or 68.112 expected retained graduates. Allocate 64 to the defined posts and treat the remainder as planning headroom. An approximate intake multiplier of 1.35 is a convenient description, not the governing formula. It cannot substitute for the rates and their period definitions.

Screening an illustrative 220 candidates to admit 86 implies an acceptance rate of about 39.1 percent. This is a workload assumption for assessments, not evidence about the quality of local applicants. The recruitment lead should keep application, completed assessment, eligibility, offer and accepted offer distinct. Otherwise an offer rejection caused by transport or remuneration can be misreported as an applicant's failure to demonstrate skill.

Selection design also affects which candidates enter the funnel. A Bangladeshi supervisor-training experiment found a mismatch between some initial gender perceptions and diagnostic evidence, with relative performance changing after practical exposure. That finding supports using structured assessment and supervised trials rather than treating managerial nomination as proof of potential. It does not provide this chapter's admission rate or justify lowering competence requirements. [S1306]

The illustrative operator funnel assumes 90 percent graduation and an 85 percent retained-availability allowance. A proposed intake of 940 produces only 719.1 expected retained operators: 940 multiplied by 0.90 multiplied by 0.85. It therefore falls below the 720-post objective. Rounding that expectation to the target would conceal the shortage. The continuous calculation requires at least 942 entrants when rounded upwards, before allowing for stage-by-stage whole-person rounding.

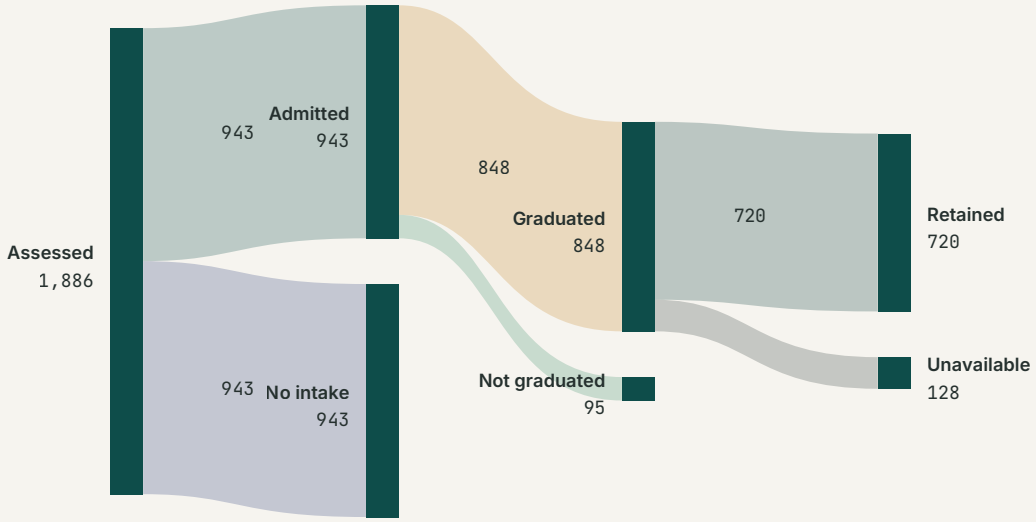
WORKED EXAMPLE: WHOLE-PERSON ROUNDING CHANGES THE INTAKE

For an illustrative target of 720 retained operators, divide by 0.85 and round upwards to obtain 848 required graduates. Divide 848 by 0.90 and round upwards to obtain 943 entrants. Applying conservative whole-person floors gives floor(943 multiplied by 0.90) = 848 graduates, then floor(848 multiplied by 0.85) = 720 retained operators. At an assumed screening acceptance of 50 percent, assess 1,886 applicants. These are deterministic planning calculations, not a statistical assurance that the target will be met.

The conserved illustrative flows in **Exhibit 53**, p. 201 retain unsuccessful transitions rather than making them disappear. The recruitment system should use more informative labels than a single rejection field. Distinguish candidates who decline, learners who defer, assessment failures awaiting reassessment and confirmed departures. Each transition needs a dated reason and an owner authorised to correct the record.

EXHIBIT 53 / ILLUSTRATIVE PEOPLE, WHOLE-PERSON PLANNING FLOORS

The operator funnel retains every assumed exit



ILLUSTRATIVE Assumed acceptance 50%, graduation 90%, retained availability 85%. Reverse rounding requires 848 graduates and 943 entrants. Forward floors yield 720 retained. Loss branches include conservative rounding. This common-endpoint allowance is not an annual turnover forecast.

A funnel expectation requires headroom if the sponsor needs a high probability of covering the establishment. Actual outcomes can vary around the assumed rates, and shared causes can affect an entire cohort. GFT recommends reporting the expected number, the deterministic rounded plan and the remaining uncertainty separately. Where evidence is insufficient for a credible probability distribution, show downside cases and decisions rather than attaching an invented confidence level.

Early retention deserves its own observation window. An Ethiopian randomised job-offer study reported extensive quitting within months and increased health problems following industrial-work exposure. Its result cautions against equating admission

with durable employment. It does not establish a turnover coefficient for a proposed Cameroon factory. Recruitment expansion should therefore accompany investigation of job conditions, worker choice and early departures. [S1303]

13.4

Training places must exist before a funnel becomes a dated staffing plan

The illustrative operator dojo has 30 stations and a four-week learning cycle. At 10 completed cycles a year, a single training shift admits at most 300 people before attendance losses or retakes. Over an illustrative eighteen-month window that is 450 places; a second equivalent shift raises the ceiling to 900. Neither ceiling accommodates the 943-entrant rounded plan. The same station cannot be promised simultaneously to a new entrant, a retake and a supervisor exercise.

If a cohort means one group of at most 30 learners, illustrative intake requires 32 groups: 31 full groups and a final group of 13. Describing that intake as 22 cohorts would be inconsistent with the station count. If cohort instead means a calendar cycle containing parallel groups, state the number of shifts and groups explicitly. Capacity should be recorded as station-hours and supervised learning-hours as well as headcount, so terminology cannot hide the constraint.

An illustrative alternative books 17 four-week calendar cycles with two groups per cycle, giving 1,020 nominal places over 68 teaching weeks. Relative to the 943 entrants, this leaves 77 nominal places for scheduling slack or additional intake. Using a planning convention of 52 weeks per year, eighteen months contains approximately 78 weeks. The remaining 10 weeks would have to accommodate shutdowns, assessment, maintenance and disruption. This is a possible slot envelope, not a validated calendar or permission to count all late graduates as fully retained.

Teaching slots alone do not prove completion. The sponsor should record instructor availability, machine availability, assessment time, curriculum language and safe access for each shift. If a late group must receive practical assessment after its planned completion, its release date moves. Retake demand should compete visibly for booked capacity. Removing it from the slot ledger produces a flattering utilisation figure while transferring delay into the staffing promise.

UNESCO's account of the joint TVET study identifies difficulties facing learners, unsupported teachers and weak provider incentives as reasons training can disappoint. GFT therefore recommends testing the whole learning arrangement, including access and assessment, before treating extra equipment as additional qualified output. The source supports this design caution; it does not certify any proposed factory-hosted programme. [S1304]

The illustrative specialist track also needs a separate timetable. Its 86 entrants undertake an assumed sixteen-week programme that cannot simply be processed through operator slots. For the initial 34 supervisor and technician learners, an 88 percent graduation assumption gives 29.92 expected graduates before retention losses.

Launch requires 28 supervisors and technicians in the proposed snapshot. That narrow margin warrants a reserve or a smaller release, especially because graduation in the wrong specialism cannot fill the missing post.

Keep the specialist split explicit within each intake. A mechanic who has demonstrated fault diagnosis cannot automatically cover work study, and a trained line supervisor cannot certify an electrical repair. GFT recommends role-specific readiness ledgers and practical sign-off. Cross-training may broaden coverage only after the additional task is assessed. The limiting role, rather than the largest pool of general graduates, should determine when another line can be released.

An illustrative rolling-capacity check shows why the initial intake is only part of the obligation. If a qualified operator establishment remains at 720 and the assumed monthly departure probability is 1.35 percent, expected departures are 9.72 people a month. At 90 percent graduation, replacement alone requires 10.8 entrants a month before whole-person rounding and reassessment. This continuing demand consumes learning capacity after the expansion intake has finished. It must not be charged to the same unused places indefinitely.

The proposed slot ledger should record reserved capacity, actual attendance, completed instruction and assessed release separately. An empty seat caused by an absent learner is not automatically reusable at short notice: another learner may lack the prerequisites for the session already under way. GFT recommends an explicit recovery rule and a named decision-maker for moving learners between groups. The operational goal is timely competence, rather than keeping every chair occupied at the expense of a coherent course.

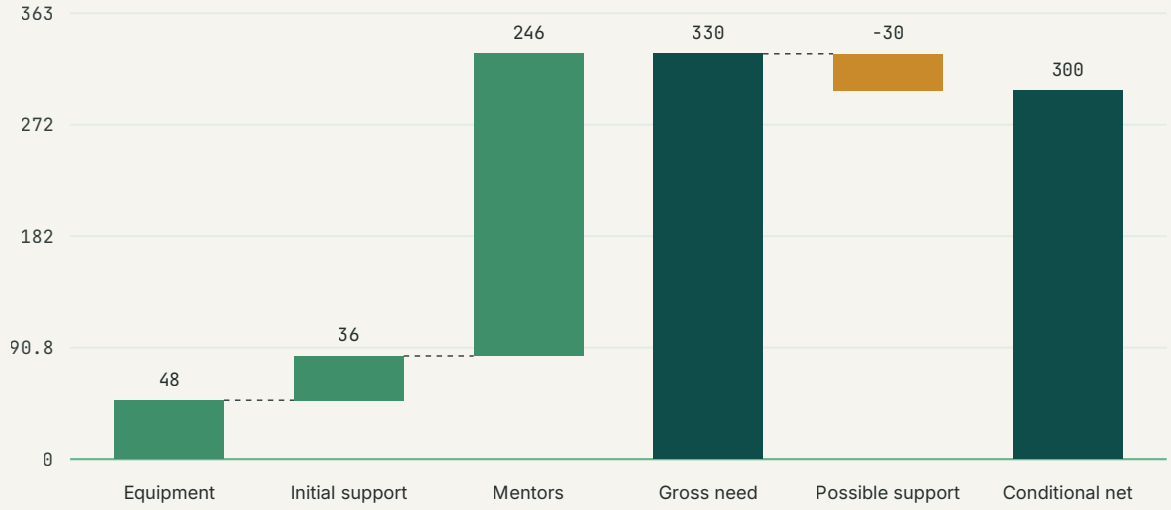
13.5

Funding must cover gross obligations before conditional support is credited

The illustrative specialist capability envelope has three gross buckets: US$48,000 for training equipment and tooling, US$36,000 for initial learner support, instruction and assessment, and US$246,000 for temporary mentors. Gross funding is US$330,000. The budget bridge in **Exhibit 54**, p. 204 also shows a possible US$30,000 external contribution, producing a conditional net US$300,000. The base funding decision should retain the gross amount until eligibility, approval and receipt are evidenced.

EXHIBIT 54 / ILLUSTRATIVE US$ THOUSANDS

Conditional support reduces net cost only after approval



ILLUSTRATIVE Assumed planning allowances: equipment 48, initial support 36 and mentors 246 sum to gross 330. Hypothetical support of 30 reduces net cost to 300 only if approved and received. No grant entitlement or supplier quotation is asserted.

The illustrative conversion convention is CFA franc (XAF) 600 per US dollar, selected only to make the budget inspectable. It is not a current exchange-rate observation. At that assumption the gross envelope is XAF 198 million and the conditional net is XAF 180 million. Actual procurement and funding decisions require dated exchange rates, payment currencies and exposure periods. Do not cite a euro peg as though it fixed a dollar conversion.

The illustrative initial-support allowance of XAF 21.6 million can be unpacked as 34 specialist learners receiving XAF 50,000 monthly for four months, 3 instructors receiving XAF 400,000 monthly for four months, and XAF 10.0 million for assessment and learning materials. The components are XAF 6.8 million, XAF 4.8 million and XAF 10.0 million. These are unquoted budget assumptions, not approved remuneration or a statement of legal sufficiency.

This illustrative envelope is deliberately limited to the specialist pipeline and shared training installation. It does not cost every operator learner, all continuing instruction, full factory payroll, employment-related charges, recruitment travel or every reassessment. The sponsor must add those items before approving an all-in workforce budget. Relabelling the specialist envelope as the total cost of staffing the factory would transfer real obligations outside the investment decision.

The illustrative mentor allowance represents 8 mentors over an average of 14 months, or 112 mentor-months. Dividing US$246,000 by that exposure gives an average loaded allowance of about US$2,196 per mentor-month. That is a reasonableness check on the assumption, not a market quotation. Prepare a contractual cash schedule covering arrival, overlap, travel and completion obligations before deciding that the allowance can purchase the intended expertise.

Cameroon's World Bank project appraisal describes competency-based training developed with employer input and a competitive skills-development fund. It supports investigating an institutional route to relevant training. It does not establish an award to this factory or eligibility for the hypothetical contribution. Finance should show an unapproved application outside committed funding, and preserve gross liquidity where an eventual reimbursement arrives after the training bill. [S1305]

13.6

Payback follows accepted volume and measured savings rather than borrowed effects

Training can improve productivity, but an experimental percentage is not an automatic unit-cost saving. An Indian garment-firm trial reported productivity increases of 7.3 percent during supervisor training and 5.8 percent during the subsequent observation period relative to control. The preliminary paper concerns its intervention and firm. It cannot establish additive savings from this chapter's supervisors, mechanics and operator training in a new setting. [S1302]

GFT recommends estimating the combined intervention at a defined cost boundary. Compare labour and relevant overhead per accepted garment under a stated counterfactual, while retaining changes in product mix, paid hours and demand. Separate a cash reduction from a capacity opportunity. Spare capacity creates cash only if it supports additional contribution or permits an actual avoidable cost. Do not value the same released minutes both as payroll savings and as extra sales.

For illustrative simple payback, divide investment by the product of annual accepted volume and incremental cash saving per accepted garment, then multiply years by 12 to express months. At 2.0 million garments a year, assumed unit savings of US$0.10, US$0.42 and US$0.75 imply annual benefits of US$200,000, US$840,000 and US$1.50 million respectively. These are sensitivity inputs, not results derived from the cited training study.

The illustrative comparison in **Exhibit 55**, p. 206 uses the same volume in every case. Conditional net funding gives paybacks of 18.0, 4.29 and 2.40 months; gross funding gives 19.8, 4.71 and 2.64 months. At zero incremental cash saving, simple payback does not occur. Exclude speculative training grants from the base case and account separately for the time needed to reach the assumed production rate.

EXHIBIT 55 / ILLUSTRATIVE US$ AND MONTHS

Payback changes with the assumed cash saving

US$/garment	Annual US$	Gross months	Net months
0.10	200,000	19.80	18.00
0.42	840,000	4.71	4.29
0.75	1,500,000	2.64	2.40

ILLUSTRATIVE Annual volume 2 million accepted garments. Benefit = volume times assumed unit cash saving. Months = investment divided by annual benefit times 12. Gross investment US$330,000; conditional net US$300,000. Excludes ramp timing, discounting, tax, financing and uncosted workforce items.

The illustrative gross envelope spread over 9.0 million accepted garments equals US$0.0367 per garment; conditional net cost equals US$0.0333. Those volumes would require three complete years at the assumed 3.0-million annual rate. A factory ramp cannot be called three full years of nameplate output without a production schedule. Furthermore, allocating expenditure per garment is not itself cash recovery, and some of the spending may recur as staff leave.

Before using payback for approval, GFT recommends a dated monthly cash model. Enter training commitments when payable, savings when realised and support when received. Retain continuing instruction and replacement costs after launch. The chapter's arithmetic is a planning method, not investment, legal or tax advice. A short simple-payback result cannot resolve employment terms, financial affordability or whether a commercial order is actually available.

13.7

Stress cases must identify the broken constraint before assigning lost output

The illustrative retained-availability allowance can be stressed without pretending to forecast annual turnover. Holding graduation at 90 percent, an 85 percent retention allowance requires 943 entrants under sequential rounding. Reducing retention to 65 percent requires 1,108 graduates and 1,232 entrants. At the same assumed 50 per-cent screening acceptance, the assessment workload rises from 1,886 to 2,464. Recalculate these quantities at the same endpoint before interpreting the difference.

The illustrative training envelope of 1,020 places would then fall short by 212 entrants. This identifies a capacity constraint, but it does not identify a specific month when the dojo saturates. That requires the dated slot ledger and the departure sched-ule. Possible responses include additional supervised capacity, earlier recruitment, retention improvements or a slower line-opening plan. Each response changes costs and timing and should be compared at the same accepted-output boundary.

A mentor delay should be priced from its actual exposure. At the illustrative loaded allowance of US$246,000 divided by 112 mentor-months, extending 8 mentors for 6 months adds approximately US$105,429. Extending 4 for the same period adds

approximately US$52,714. Neither result establishes how long production expansion must wait. That depends on which local roles remain uncertified and whether qualified temporary coverage can safely sustain the existing lines.

A mechanic shortage should enter the machine and task availability calculation. In an illustrative case, if mean operating time between failures stays at 180 minutes, increasing mean repair time from 18 to 36 minutes reduces the simple availability ratio from 180/198, or 90.91 percent, to 180/216, or 83.33 percent. The fall is 7.58 percentage points. This assumed repairable-system example excludes planned stops, parts delays outside the definition and interactions between machines.

That illustrative availability loss must not be multiplied automatically by the factory's nameplate garment volume. The model must establish whether the affected equipment constrains the line and whether other machines, buffers or qualified mechanics can absorb the interruption. A downtime ratio for non-critical equipment may have little immediate effect on shipments. Conversely, a missing specialist on the binding operation may stop a line even while overall headcount appears adequate.

Stress related assumptions together where the mechanism warrants it. A difficult commute might reduce both course attendance and early retention; an instructor absence might delay assessment while increasing mentor exposure. GFT recommends recording the causal link and the proposed corrective action. Merely changing unrelated percentages in isolation can understate the cash and staffing consequences of an event that affects the entire learning arrangement.

13.8

Monthly planning must reconcile people by role and cohort age

A monthly workforce ledger should begin with opening qualified people, add newly released graduates and qualified transfers, then subtract departures, transfers out and temporary unavailability according to a consistent stock definition. Reconcile closing payroll employment separately from deployable capability. A worker on authorised leave remains employed but may not cover today's task. A returning worker should not be counted as both a new recruit and a recovered absence.

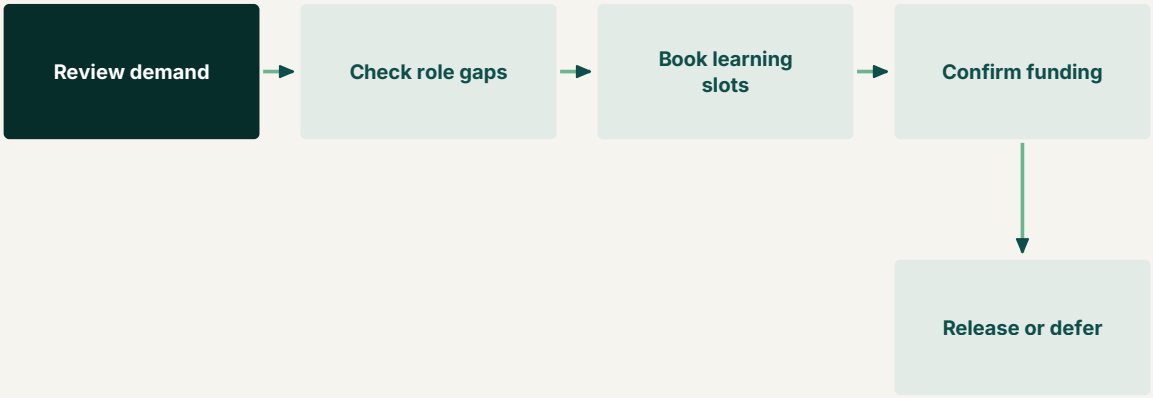
For the illustrative operator track, applying a common 15 percent loss allowance to all graduates is a screening simplification, not an annualised turnover calculation. If instead 15 percent means annual departure probability under a constant monthly hazard, the monthly probability is 1 minus 0.85 raised to the power 1/12, approximately 1.35 percent. Cohorts then face different exposure durations. The latest graduate cannot be assigned the same accumulated departure probability as the earliest without an explicit conservative allowance.

GFT recommends keeping recruitment, training and deployment as separate dated commitments in the sales and operations planning meeting. HR presents applications and accepted offers, training presents completed learning and pending assessments, operations presents authorised deployment, and finance presents committed and remaining cash. Customer commitments should use the constrained role and expected release date, rather than the total number of people attending courses.

The proposed information sequence in **Exhibit 56**, p. 208 keeps assumptions visible through the decision. It is a recommended control design. It does not assert that a named software planner has been implemented or validated. A forecast from any analytical system should enter as a demand scenario until its order boundary and reliability have been reviewed by the accountable commercial role.

EXHIBIT 56 / PROPOSED MONTHLY DECISION SEQUENCE

A release decision reconciles demand, capability and cash



ILLUSTRATIVE Illustrative control design. Review constrained roles and dated learning slots before authorising recruitment, production release or order commitments. A forecast is an input, not a confirmed order.

At each review, preserve the previous forecast beside the new forecast and explain the change. A revised graduation assumption should have a stated basis, such as completed assessments or an identified timetable disruption. Compare predicted releases with actual qualified deployment by cohort. This turns the planning exercise into a learning record, instead of a succession of revised totals that cannot be audited.

> **WORKED EXAMPLE: A MONTHLY STOCK CLOSES WITHOUT COUNTING LEARNERS AS OPERATORS**
>
> An illustrative month opens with 480 qualified operators on the employment ledger. It adds 54 newly qualified graduates and records 8 confirmed departures, closing at 526 qualified employees. If 16 of those employees are unavailable for the planned deployment window, the deployable stock is 510. Against an illustrative requirement of 530 qualified people, the employment gap is 4 but the deployment gap is 20. A further 60 learners still in training do not close either gap until their release. This example assumes no other transfers and treats temporary unavailability separately from departure.

The meeting should ask which tasks the missing people would cover before choosing a response. Moving a qualified operator from another line may solve the visible gap while creating a new bottleneck elsewhere. Adding a late training group may arrive after the order's required start. An interim response should therefore identify the

affected operation, the displaced activity and the expiry of the arrangement. The production plan should retain any remaining restriction rather than treating a temporary exception as permanent capacity.

GFT recommends a compact set of acceptance questions for the underlying data. Can the employment total be reconciled to the payroll register? Can every claimed qualification be traced to a completed assessment? Can each deployment be matched to the required task and shift? Can a learner's planned release be reconciled to a funded slot and an available assessor? Where the answer is unresolved, retain the gap visibly and assign its resolution to the accountable role.

The approval packet should contain the reconciled establishment, role-specific gap ledger, dated learning slots, gross cash commitments, conditional funding and downside response. GFT recommends that the authorised release identify its remaining uncertainty and the next evidence required. The result is a practical expression of Warp and Signal: production plans carry their own measurement conditions, and the organisation learns whether its recruitment promises become usable capability.

A recruitment promise becomes capacity only when a qualified person can cover the required work.

CHAPTER SOURCE NOTES

S1301 International Labour Organization. 2019-08-26.

S1306 University of Warwick Department of Economics. 2015-12.

S1303 American Economic Association. 2018-07.

S1304 UNESCO. 2023-08-11.

S1305 World Bank, International Development Association. 2020-06-24.

S1302 National University of Singapore Department of Economics, hosting authors working paper. 2021-10-06.

14

An Eighteen-Month Rollout Gates Factory Scale on Supervisory and Data Readiness

A garment venture stays solvent by refusing to spend into the next phase until the supervisory and data conditions of the current phase are proven; GFT closes with its actionable recommendations, four-phase roadmap and shop-floor scorecard.

CHAPTER 14
DECISION TEST

A garment venture stays solvent by refusing to spend into the next phase until the supervisory and data conditions of the current phase are proven; GFT closes with its actionable recommendations, four-phase roadmap and shop-floor scorecard.

A greenfield garment factory in Sub-Saharan Africa protects solvency and turns low nominal wages into low unit costs only when expansion is governed by condition gates tied to supervisory readiness and verified data capture. Across emerging industrial parks, apparel ventures fall into a turnover and underutilisation trap when sponsors install twenty lines before certifying local cohorts of supervisors, work-study technicians or mechanics. [S06] [S24] In Cameroon, the statutory monthly minimum wage (SMIG) rose by 5 percent from XAF 41,875 in 2023 to XAF 43,969 from 23 February 2024, or about US$76 a month, roughly one-third of Cambodia's US$204 benchmark. [R14] [R17] Yet firm-level econometrics across Sub-Saharan Africa show that low wages fail to lower unit labour costs whenever weak supervision, unbalanced stations, breakdowns and early quitting depress utilisation. [S11] [S28] Cameroon's state-backed incumbent, CICAM, illustrates the cost of unmeasured capacity: its domestic share fell from about 85 percent three decades ago to about 5 percent, with July 2023 utilisation at 33.7 percent in Garoua, 48.9 percent at CICAM 1 and 10.83 percent at CICAM 2, costing roughly CFAF 2 billion in 2020 underutilisation losses and driving restructuring estimates of CFAF 30.7 to 48.2 billion (and one relaunch plan at CFAF 70.2 billion). [R11] [R12] [R13]

To prevent a greenfield maker from repeating that collapse, Green Future Tech Limited (GFT), Hong Kong SAR, structures its illustrative 3.0-million-garment, 900-person Cameroon cut-make-trim (CMT) programme around an eighteen-month, four-phase rollout in which line construction, cohort graduation, performance cadence and ML deployment advance together. [S08] [S31] This concluding chapter synthesises the preceding thirteen chapters into an executable framework: the four-phase spine (Phase 0 Set up, Phase 1 Launch and stabilise, Phase 2 Scale, and Phase 3 Optimise), three condition precedent gates, four Performance-Management System (PMS) maturity levels, the twelve-metric Shop-Floor Scorecard, and eight recommendations for sponsors, park operators and Cameroonian TVET authorities. [S17] [S18] [S42] All planning figures are grounded in cited benchmarks or labelled as illustrative estimates, and nothing here is investment, legal or tax advice.

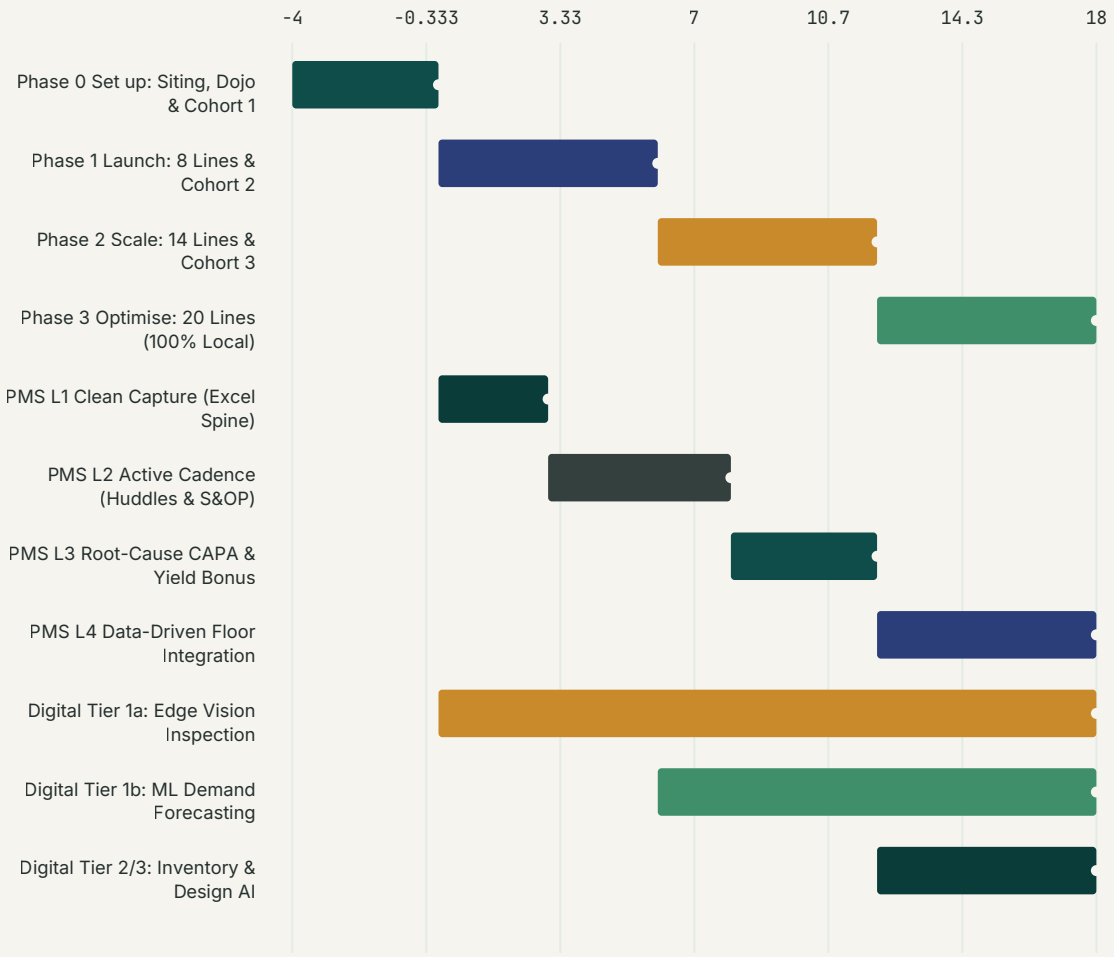
14.1

The unified four-phase spine across GFT's Cameroon textile programme synchronises capital, cohorts and data

Greenfield apparel failures often start with desynchronised schedules: civil contractors finish the shell on one timeline, machine vendors deliver equipment on a second, HR teams hire unconditioned recruits on a third, and software vendors pitch dashboards before hourly logs exist. [S06] [S12] In GFT's three-part Cameroon textile programme (the Feasibility Study, the Performance-Management System Design and the Digital Strategy, prepared 31 January 2024 with source refreshes retained in 2026), Section 12 of the Feasibility Study, Section 7 of the PMS Design and Section 7 of the Digital Strategy share one four-phase roadmap. [R06] [R07] Under this spine, a phase is not a calendar date; it is a verified operating state coupling active lines, certified local supervisors and technicians, validated spreadsheet logs and calibrated digital tools (see **Exhibit 57**, p. 212). [S20] [S35]

EXHIBIT 57 / MONTHS RELATIVE TO COMMERCIAL LAUNCH (MONTH -4 TO MONTH 18)

Unified eighteen-month roadmap aligning Workforce Cohorts, PMS Maturity Levels and Digital Strategy Tiers across Phases 0 to 3



SOURCED [R10] [R27] [R29] [R31] [S20] [S35] Master programme schedule from GFT Feasibility Study Section 12, PMS Design Section 7 and Digital Strategy Section 7. Planning positions are illustrative programme milestones gated on condition-precedent audits, not unconditional calendar commitments.

14.2 PHASE 0 (MONTHS -4 TO 0: SET UP) ESTABLISHES THE PHYSICAL AND HUMAN FOUNDATION BEFORE COMMERCIAL SEWING BEGINS

The four months before launch (Months -4 to 0 in the illustrative schedule) determine whether the plant opens as an engineered system or an improvised workshop. [S31] [S35] During Phase 0, the sponsor settles the siting trade-off between the Douala-Dibamba corridor in the Littoral region (port access, urban pools where 40 percent of adults have prior vocational exposure, and Camtext SA's planned 12,000-job Dibamba hub) and the northern Garoua cotton belt (adjacent to SODECOTON's 220,000+ growers, nine gins processing 314,455 to 340,000 tonnes of seed cotton in 2022 to 2024 and projected above 350,000 tonnes in 2025, Camtext SA's planned 3,000-job Garoua site and community centres such as Gaaraadji). [R01] [R02] [R03] [R10] [S33] [S42] Management also locks in cotton yarn and fabric terms supporting Cameroon's SND30 target of lifting local cotton processing from roughly 5 percent (95 percent raw export) to 50 percent by 2030. [R06] [R07]

Rather than hiring staff only after the floor is built, Phase 0 ring-fences an illustrative pre-operating budget of about US$300,000 (XAF 180 million at 590 to 610 XAF per US dollar, alongside the 655.957 XAF per euro peg) to stand up the 30-station Vestibule Training Dojo four months before Shift 1. [R32] [S35] Active Phase 0 payroll is capped at an illustrative 68 foundational staff: 8 imported mentors on 12-to-18-month handoff contracts, 18 Cohort-1 supervisor trainees, 16 Cohort-1 mechanic and IE trainees, 10 QA and vision leads, 6 trainers and HR staff, and 10 plant managers and engineers. [S08] [S09] [S10] Because ILO industrial-park assessments show that 54 percent of hired garment workers require post-hire upgrading to reach international standards, the dojo inducts the first 240 operators through the four-week Analytical Method of Training (AMT) syllabus during the final six weeks of Phase 0 while configuring the Excel PMS pack and calibrating the edge vision cameras. [R29] [S07] [S35]

14.3 PHASE 1 (MONTHS 1 TO 6: LAUNCH AND STABILISE) PROVES UNIT ECONOMICS ACROSS EIGHT LINES ON DOMESTIC CHANNELS

Once the opening gate passes at Month 0, Phase 1 starts the first 8 lines (30 to 34 stations per line, at an illustrative 1.0-million-garment run rate and 330 staff, including 240 operators). [S08] [S31] Because Cameroon's US AGOA eligibility ended on 1 January 2020 and remained ineligible for 2025, Phase 1 does not rely on intercontinental preferences. [R18] Instead, it serves domestic demand (where clothing and footwear spend reached US$94.70 and 8.0 pieces per person in 2024, within an African textile market estimated at US$37.3 billion in 2025 and projected at US$49.41 billion by 2030 and US$72.7 billion by 2035) across traditional wear and urban basics. [R24] [R25] [R26]

On the floor, Phase 1 runs on two capabilities needing zero sales history: the manual Excel PMS (recording hourly Line, Quality, Cost, People and Sustainability Logs) and Tier-1 edge vision inspection. [R29] Where manual inspection achieves 60 to 70 percent accuracy and misses 20 to 30 percent of defects, edge cameras scanning fabric at 60 metres a minute and checking end-of-line tables exceed 90 percent accuracy across 40+ defect types alongside four-times-per-shift inline Traffic Light System (TLS) patrols. [R29] [S37] Across Months 1 to 6, Cohort-1 deputies progress from shadowing mentors (Months 1 to 3) to co-chairing daily 10-to-15-minute huddles and skill-matrix swaps (Months 4 to 6) as Cohort 2 enters the dojo. [S04] [S20] [S36]

14.4 PHASE 2 (MONTHS 7 TO 12: SCALE) EXPANDS TO FOURTEEN LINES AND ACTIVATES MACHINE-LEARNING DEMAND FORECASTING

Passing Gate 1 to 2 at Month 6 releases Phase 2 capital for 6 more lines, taking the plant from 8 to 14 lines (an illustrative 2.0-million-garment run rate and 615 staff, including 480 operators). [S08] [S31] Commercially, Phase 2 adds uniform contracts and opens regional distribution across CEMAC and AfCFTA corridors as textile tariff rules (outside the initial 92.3 percent agreed AfCFTA lines) and domestic eCommerce (projected to grow from US$20.32 million in 2023 to US$33.61 million by 2027 at 13.41 percent a year) expand. [R23] [R26]

At Month 7, Cohort-1 local supervisors take solo ownership of Lines 1 to 8 while certified Cohort-2 supervisors lead Lines 9 to 14 under tapering mentor audits. [S09] [S22] With six months of clean SKU production, quality and sales logs accumulated in Phase 1, the Digital Strategy activates its second Tier-1 capability: ML demand forecasting. [R27] McKinsey benchmarks show that AI and ML forecasting in fashion cut forecast

errors by 20 to 50 percent, reduce inventory costs by 35 to 40 percent, cut lost sales by up to 65 percent and raise revenue per customer by 15 to 25 percent. [R27] In Months 9 to 12, the plant also activates PMS Level 3: the yield-gated bonus above the XAF 43,969 floor and the CAPA loop. [R14] [S21]

14.5 PHASE 3 (MONTHS 13 TO 18 AND BEYOND: OPTIMISE) REACHES TWENTY LINES UNDER FULL LOCAL CAMEROONIAN LEADERSHIP

Clearing Gate 2 to 3 at Month 12 authorises Phase 3 expansion to 20 lines (an illustrative 3.0 million garments a year and 900 staff: 720 operators and 180 leadership, technical, quality and support staff). [S08] Between Months 13 and 18, Cohort-1 Shift Superintendents mentor Cohort-3 supervisors, and all 8 expatriate mentors finish their escrow handoff audits and exit by Month 18, leaving 100 percent of the 36 supervisory and 24 technician posts held by Cameroonian nationals. [S09] [S10] With a year of clean logs, Phase 3 deploys Tier-2 inventory optimisation (managing yarn, fabric and trim buffers against CFA franc and Douala port exposure) and digital printing before piloting Tier-3 multi-model design-to-specification pipelines coupling fabric, shade and silhouette generation with physics simulation. [R27] [R30] [R31] [R32]

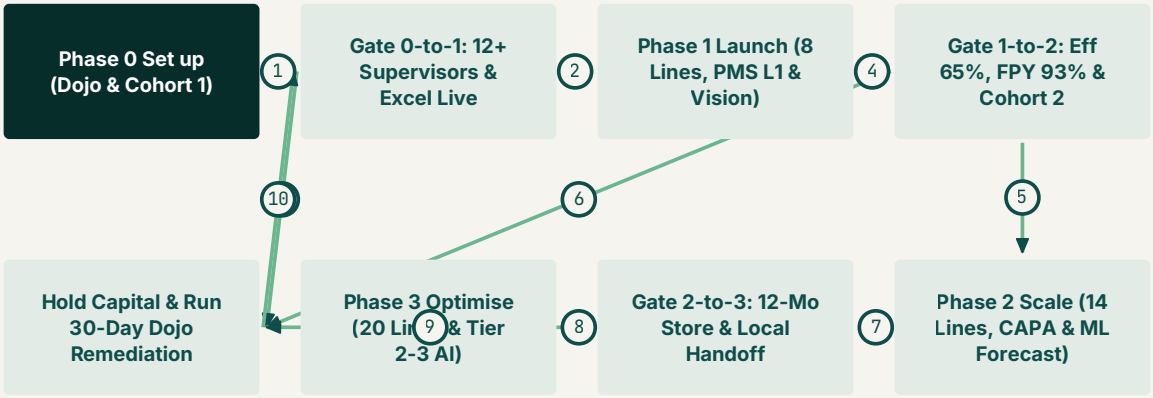
14.6

Conditions precedent ensure that proven supervisory and data readiness gate every capital release

The rule in Section 12 of GFT's Feasibility Study is that phase transitions follow audited floor evidence, never the calendar. Commissioning lines while existing lines suffer from untrained supervisors, unbalanced stations or unrecorded rework multiplies losses, repeating the underutilisation drain that cost CICAM roughly CFAF 2 billion in 2020. [R12] [S06] [S11] GFT enforces three Condition Precedent Gates (Gate 0-to-1, Gate 1-to-2 and Gate 2-to-3) audited jointly by the Sponsor, Plant Manager, HR Lead and Financial Controller (see **Exhibit 58**, p. 215). [S25] [S26]

EXHIBIT 58 /

Condition-gate decision architecture showing how supervisory and data-capture proofs open Phase 1, Phase 2 and Phase 3 capital spend



1. Month 0 Audit
2. Pass all 5 proofs
3. Fail proof
4. Month 6 Audit
5. Pass all 6 proofs
6. Fail proof
7. Month 12 Audit
8. Pass all 6 proofs
9. Fail proof
10. Re-test

SOURCED [R12] [R14] [R27] [R29] [S20] [S31] [S36] [S38] Stage-gate capital release logic from GFT Feasibility Study Section 12 and PMS Design Section 7. Any failed gate triggers a mandatory 30-day remediation sprint inside the Vestibule Dojo and active lines before expansion capital is released.

14.7 GATE 0-TO-1 (AUTHORISING PHASE 1 COMMERCIAL LAUNCH) REQUIRES CERTIFIED FRONTLINE LEADERSHIP BEFORE LINE 1 STARTS

Before releasing working capital for cutting and opening Lines 1 to 8 at Month 1, the venture must pass five proofs: [R03] [S35]

1. **Siting, power protection and cotton offtake:** Site lease signed (Douala-Dibamba or Garoua), AVR and UPS installed on servo and vision circuits, and yarn or fabric agreements executed with SODECOTON cotton provenance. [R03] [R09]
2. **Vestibule Training Dojo operational:** The 30-station dojo runs with 3 local trainers and the master trainer, having graduated at least 240 Phase 1 operators at ILUO Level L (60 percent+ efficiency) through the four-week AMT syllabus. [S35] [S36]

3. **Cohort-1 supervisor and technician certification:** At least 12 local supervisors (at least 60 percent female, selected via blind dojo trials) and 8 local mechanics and IE technicians complete the 120-hour curriculum and pass practical tests in heuristic balancing (RPW, LCR and Kilbridge-Wester), time study and hook timing. [S01] [S20] [S31] [S39]
4. **Manual PMS Excel spine live:** The companion Excel pack is configured with locked drop-downs, 40-defect codes and XAF 43,969 statutory wage rules, verified during dojo stamina runs. [R14] [R29]
5. **Tier-1 edge vision calibrated:** Fabric-table and end-of-line cameras run local inference above 90 percent detection accuracy without cloud dependency. [R29]

14.8 GATE 1-TO-2 (AUTHORISING PHASE 2 EXPANSION FROM 8 TO 14 LINES) REQUIRES ACTIVE CADENCE AND BREAKEVEN EFFICIENCY

At Month 6, capital for Lines 9 to 14 releases only when Lines 1 to 8 pass six proofs across 20 consecutive shifts (four 40-hour weeks): [R16] [S20]

1. **Line efficiency and balance:** Average sewing efficiency across Lines 1 to 8 reaches at least 65.0 percent of SAM, and IE balance efficiency reaches at least 82.0 percent (up from the 67.6 percent unbalanced benchmark toward the 85.9 to 97.35 percent heuristic range). [S31]
2. **Right-First-Time quality:** Inline TLS patrols and end-of-line vision hold DHU below 6.5 and First-Pass Yield (FPY) at or above 93.0 percent. [R29] [S21] [S37]
3. **Maintenance MTTR control:** Operator autonomous maintenance exceeds 90 percent compliance, and zone mechanics hold Mean Time to Repair (MTTR) below 22 minutes, keeping Availability above 90 percent. [S38] [S39]
4. **Active PMS Level 2 cadence:** Daily 10-to-15-minute huddles and weekly 45-to-60-minute plant reviews run on schedule, closing at least 85 percent of actions on time. [S25] [S26]
5. **Polyvalence and retention:** At least 75 percent of stations satisfy the 3-by-3 Polyvalence Rule (at least three Level-L+ operators), with annualised turnover below 20 percent. [S24] [S36]
6. **Cohort-2 graduation:** Cohort-1 local supervisors pass solo audits on Lines 1 to 8, and Cohort 2 (10+ supervisors and 6+ mechanics and IE technicians) graduates for Lines 9 to 14. [S02] [S22]

14.9 GATE 2-TO-3 (AUTHORISING PHASE 3 SCALE FROM 14 TO 20 LINES) REQUIRES TWELVE MONTHS OF CLEAN DATA AND LOCAL HANDOFF

At Month 12, releasing capital for Lines 15 to 20 and 900 staff requires six proofs across 30 consecutive shifts: [R27] [S08]

1. **Sustained OEE and yield:** Lines 1 to 14 sustain sewing efficiency at or above 75.0 percent, OEE at or above 72.0 percent, and FPY at or above 95.0 percent (DHU below 4.5). [R29] [S20] [S31]
2. **Incentive integrity:** The Level 3 yield-gated bonus runs for three monthly cycles above the XAF 43,969 floor with zero quality bypasses or payroll disputes. [R14] [S24]

3. **Validated 12-month data store:** Twelve months of audited shift, defect, downtime and SKU sales logs sit in the core data store, with Tier-1 ML forecasting cutting SKU error by at least 20 percent in S&OP reviews. [R27]
4. **Supervisory localisation readiness:** Cohort-1 Shift Superintendents and Cohort-3 supervisors and technicians pass certification, enabling the Month 13 to 18 exit of all 8 expatriate mentors. [S09] [S10]
5. **Polyvalence and low attrition:** At least 85 percent of stations meet the 3-by-3 Polyvalence Rule, operator turnover sits below 16 percent, and local supervisor turnover sits below 8 percent. [S27] [S36]
6. **Commercial backlog:** Confirmed orders across domestic retail, uniforms and CEMAC buyers cover at least 70 percent of the 1.0-million-garment capacity of Lines 15 to 20. [R24] [R26]

CONDITION-GATE AUDIT PROTOCOL AND HOLD-RELEASE MECHANICS

Every gate is audited at Month 0, Month 6 and Month 12 over a 20-shift window from the Excel PMS pack and physical walk-throughs. [S25] [S36] A gate is binary: all proofs must pass together. If any metric fails (for example, if efficiency hits 68 percent at Month 6 but FPY sits at 89 percent, or if only 7 of 10 Cohort-2 supervisors pass their balancing exam), expansion capital freezes in a 30-day **Hold and Remediate** sprint while IE, dojo trainers and mentors run CAPA fixes before re-testing over 15 shifts. [S21] [S35]

WORKED EXAMPLE: CASH-BURN PROTECTION FROM ENFORCING CONDITION GATES DURING A SUPERVISORY DELAY

Consider an illustrative Month 6 decision where strong demand prompts sales to request immediate expansion from 8 lines (240 operators) to 14 lines (420 operators, adding 6 lines, 180 operators and 45 support staff), but Gate 1 to 2 reveals that Cohort-2 trainees missed their line-balancing and TLS quality gates. [S04] [S31] [S37]

If the sponsor **waives Gate 1 to 2** and staffs Lines 9 to 14 with untrained promoted operators, the 6 lines run over Months 7 to 9 at an illustrative baseline of 38 percent efficiency and 16 percent rework (31.9 percent net yield), versus 68 percent efficiency and 5 percent rework under certified supervisors. [S20] [S21] [S22] At the XAF 43,969 monthly SMIG base (about US$76) plus statutory charges, meal/transport provisions and line depreciation, running those 6 lines costs an illustrative US$26,500 (about XAF 15.9 million at 600 XAF per US dollar) per month. [R14] [R32] On a 14.5-SAM shirt over a 40-hour week (10,000 operator minutes a month), 180 operators at 31.9 percent net yield produce only 39,600 good shirts a month (US$0.669 per shirt), plus an illustrative US$4,800 a month in ruined fabric. [R16] [S31] [S37] Over three months, waiving the gate burns an illustrative US$43,500 (XAF 26.1 million) in excess unit costs and scrap. [R12] [S06]

If the sponsor **enforces Gate 1 to 2** and holds Lines 9 to 14 for a 45-day dojo remediation sprint (costing an illustrative US$2,100 / XAF 1.26 million in stipends and instructor time), Cohort 2 enters Lines 9 to 14 certified in Month 8.5, ramping to 65 percent efficiency and 94 percent FPY (61.1 percent net yield, or 75,850 good shirts a month at US$0.349 per shirt). [R14] [S20] Enforcing the gate saves an illustrative net US$41,400 (XAF 24.8 million) within one quarter.

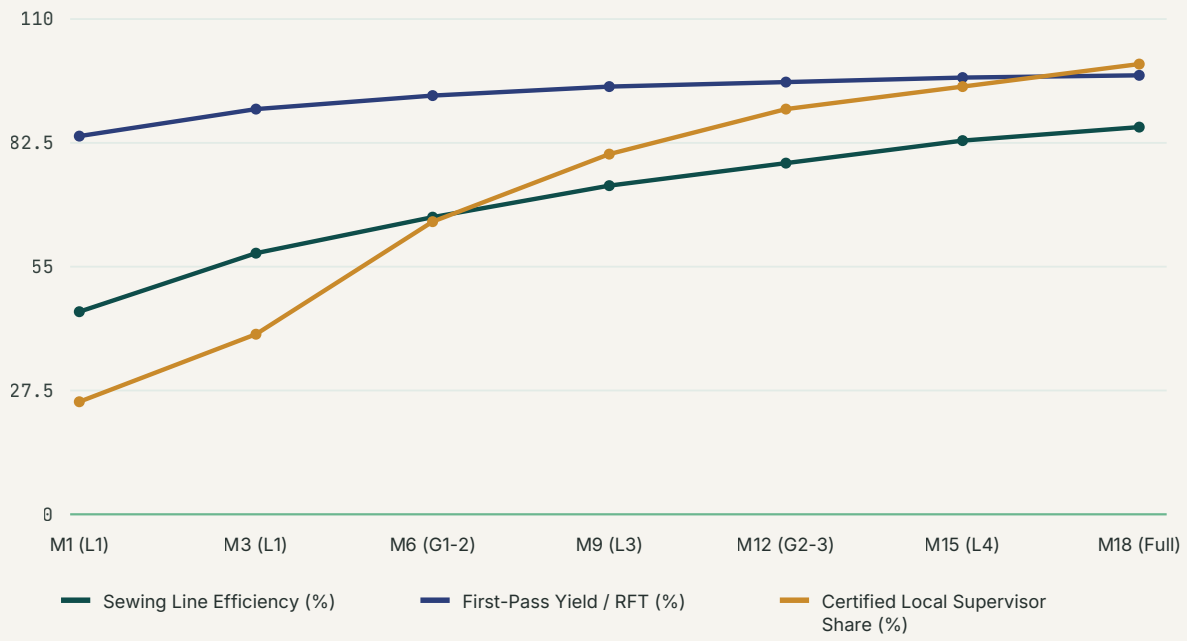
14.10

Climbing the four PMS maturity levels transforms manual capture into a data-driven floor

Installing enterprise software or predictive AI on a floor where supervisors cannot yet keep an accurate hourly tally of good bundles and stitch defects digitises noise. [S06] [S15] In Section 7 of GFT's Performance-Management System Design, floor governance climbs four sequential maturity levels over eighteen months (Level 1 Clean Capture, Level 2 Active Management, Level 3 Root-Cause Improvement, and Level 4 Data-Driven Floor), each building the habits and clean data required by the next (see **Exhibit 59**, p. 218). [R27] [S20] [S25]

EXHIBIT 59 / PERCENTAGE OF TARGET BENCHMARK

Illustrative eighteen-month progression of sewing line efficiency, First-Pass Yield and local supervisory ownership across PMS Levels 1 to 4



DERIVED [R29] [S02] [S20] [S21] [S25] [S31] Illustrative programme trajectory anchored on empirical benchmarks: Hawassa line balancing from 67.6% to >85% (S31), Better Work SST +22% productivity (S20), ILO SCORE -12% rework (S21), Indian textile RCT +17% first-year productivity (S25, S26) and >90% computer-vision defect detection (R29).

14.11 LEVEL 1 (MONTHS 1 TO 3: CLEAN CAPTURE) ESTABLISHES POINT-OF-WORK RECORDING IN THE VALIDATED EXCEL SPINE

Where 89.5 to 90.0 percent of Cameroon's workforce is informal and 66.9 percent learned trades without written tickets, recording numbers at the station is a foundational habit. [R16] [S41] [S42] In Level 1, GFT's Excel pack serves as the single System of Record across five sheets, each with one named owner: [S25]

- **Line Log (Line Supervisor):** Hourly good pieces against SAM targets, active operators and downtime minutes by cause code (mechanical, needle/thread, panel shortage, power sag or absence). [S04] [S31]

- **Quality Log (QA Lead):** Four-times-per-shift inline TLS card counts (Green, Yellow, Red), end-of-line tallies, edge-vision flags and defect codes D01 to D40. [R29] [S37]
- **Cost and Labour Inputs (Controller and IE Lead):** Attended 40-hour standard and 1.2x overtime hours tied to the XAF 43,969 floor and pay bands. [R14] [R16]
- **People Log (HR Lead):** Shift attendance, turnover, dojo graduations and the live ILUO and efficiency Skill Matrix. [S35] [S36]
- **Sustainability Log (Plant Engineer):** Daily metered water (litres), electricity (kWh) and weighed cutting scrap per garment. [S40]

Validation rules block invalid dates, station IDs or defect codes, and mentors audit 100 percent of shift logs against finishing-room bundle tickets nightly. [S25]

14.12 LEVEL 2 (MONTHS 4 TO 8: ACTIVE MANAGEMENT) LOCKS IN THE DAILY, WEEKLY AND MONTHLY OPERATIONAL RHYTHMS

Once three months of clean capture verify that logs match output, Level 2 embeds the three rhythms of Deliverable 2 Section 5: [S20] [S25]

1. **Daily Line Huddle (10 to 15 minutes at shift start):** The supervisor reviews yesterday's output, DHU (holding up physical defective samples) and downtime at the board, runs the morning skill-matrix swap for absent operators, and assigns two station fixes. [S04] [S22] [S36]
2. **Weekly Management Review (45 to 60 minutes every Monday):** The Plant Manager, Shift Superintendents, IE Lead, Chief Mechanic, QA Manager, HR Lead and Controller review the six-family KPI Dashboard, audit dojo cohorts and assign owners and dates to bottlenecks. [S25] [S38]
3. **Monthly S&OP Review (half-day in Week 1):** Leadership reconciles the 90-day order book against certified headcount, 3-by-3 skill-matrix coverage, SODECOTON fabric supply and cash flow. [R03] [S36]

Randomised trials in Indian textile factories show that structured daily and weekly reviews across quality, maintenance and inventory raised productivity by 11 percent initially and 17 percent in Year 1, adding roughly US$230,000 in annual profit per plant. [S25] [S26]

14.13 LEVEL 3 (MONTHS 9 TO 12: ROOT-CAUSE IMPROVEMENT) COUPLES YIELD-GATED INCENTIVES WITH THE CAPA ENGINE

Waiting until Month 9 to launch variable bonuses prevents operators from gaming early SAM targets or rushing bad seams downstream. [S20] [S24] At Level 3, lines are balanced via RPW, LCR or Kilbridge-Wester heuristics, and the bonus sits above the XAF 43,969 monthly floor, gated by a Quality Multiplier requiring Line FPY to clear 93 to 96 percent with zero open Red TLS cards. [R14] [S31] [S37] Meanwhile, the weekly CAPA engine uses defect Pareto and downtime charts to run five-why fixes (folder guides, hook timing or sleeve-head coaching) across all lines; in ILO SCORE garment evaluations, such quality loops raised productivity by 15 percent and cut rework by 12 percent. [S21] [S35] [S39]

14.14 LEVEL 4 (MONTHS 13 TO 18: DATA-DRIVEN FLOOR) EMBEDS COMPUTER VISION AND ML FORECASTING INTO ROUTINE DECISIONS

By Month 13, a full year of clean records sits in the core data store, connecting the Digital Strategy (Deliverable 3 Section 5) directly into daily huddles and monthly S&OP reviews. [R27] [R29] At the huddle, the Quality Log pairs human TLS checks with edge-camera defect classifications (above 90 percent accuracy across 40+ defect types in a global fabric-vision AI market growing from US$523.4 million in 2024 to US$6,522.1 million by 2033 at 33.8 percent a year), while QA confirmations feed MLOps retraining. [R28] [R29] [S37] At S&OP, Tier-1 ML demand forecasting and Tier-2 inventory models use the 12-month history to project 90-to-180-day SKU demand and reorder points, capturing McKinsey's 20 to 50 percent forecast-error reduction and 35 to 40 percent inventory savings. [R27]

> **GFT NOTE**
>
> GFT's engineering rule for greenfield sponsors is direct: do not buy or customise an ERP or MES suite during Phase 0 or Phase 1. Where supervisors cannot yet record hourly output and defect codes accurately on a clipboard and Excel sheet, six-figure software digitises noise and drains management focus. [S06] [S25] Run the validated Excel PMS from Shift 1 through Month 12, let the daily, weekly and monthly cadences harden into habit, and migrate the proven schemas into a database and BI tool only after passing Gate 1 to 2 or Gate 2 to 3.

14.15

A twelve-metric Shop-Floor Capability and Performance Scorecard governs daily and monthly decisions

Following Deliverable 2's rule that a supervisor who watches five controllable numbers acts on all five while one handed thirty watches none, GFT consolidates plant and pipeline governance into a twelve-metric **Shop-Floor Capability and Performance Scorecard** across all six KPI families (see **Exhibit 60**, p. 221). [R14] [R29] [S20] [S31] [S36] [S38]

EXHIBIT 60 / PERCENTAGE, MINUTES, DHU OR XAF/USD PER UNIT AS SPECIFIED

The twelve-metric GFT Shop-Floor Capability and Performance Scorecard across Phases 1, 2 and 3

KPI Family & Metric ID	Operational Definition & Excel Sheet	Uncoached Baseline	Phase 1 Gate (M6)	Phase 2 Gate (M12)	Phase 3 Target (M18)
Production: M01 Line Efficiency & M02 Line OEE	SAM earned / attended mins (S31); Availability x Performance x FPY [Line Log]	38% / 42%	65% / 60%	75% / 72%	85% / 78%
Maintenance: M03 Mechanic MTTR	Notification + diagnosis + wrench + stitch test mins per fault (S38, S39) [Line Log]	42 mins	22 mins	18 mins	14 mins
Quality: M04 Inline/EOL DHU & M05 First-Pass Yield	Defects per 100 units; % units passing first time + >90% vision (R29) [Quality Log]	18.5 / 82%	6.5 / 93%	4.5 / 95%	3.5 / 97%
Delivery: M06 On-Time-In-Full (OTIF) & M07 Huddle/CAPA Closure	% orders shipped complete on date; % weekly CAPA fixed on time [Monthly Review]	62% / 40%	88% / 85%	93% / 90%	96% / 95%
Cost: M08 Effective Labour Cost Index	Direct + supervisory payroll (XAF 43,969 floor, R14) per good SAM [Cost & Labour]	1.85x target	1.25x target	1.08x target	1.00x target
People: M09 Daily Absenteeism & M10 Annual Turnover	Unexcused absent %; annualised operator / supervisor exits (S24) [People Log]	7.5% / 45%	4.5% / 20%	3.8% / 16%	3.0% / 12%
Capability: M11 3x3 Skill-Matrix Coverage & Local Share	% stations with >=3 Level-L+ operators (S36); % local supervisors [People & Sust.]	15% / 0%	75% / 65%	85% / 90%	92% / 100%
Sustainability: M12 Water, Energy & Cutting Waste per Unit	Measured kWh, litres & % marker scrap per good garment [Sustainability Log]	Unmeasured	Baseline -5%	Baseline -12%	Baseline -20%

DERIVED [R12] [R14] [R29] [S20] [S21] [S24] [S31] [S36] [S38] [S39] Consolidated 12-metric governance scorecard across GFT's 6 KPI families (Deliverable 2 Sections 3, 7 and 8). Baselines reflect empirical African/incumbent benchmarks (CICAM R12, Hawassa S31, manual inspection R29); Phase 1 to 3 targets represent GFT's illustrative condition-gate thresholds.

14.16 PRODUCTION AND MAINTENANCE METRICS (M01, M02 AND M03) GOVERN PHYSICAL FLOW AND MACHINE UPTIME

M01 (Sewing Line Efficiency) divides SAM earned (good garments times SAM) by attended operator minutes, rising from a 38 to 67.6 percent baseline to gates of 65 percent (Month 6), 75 percent (Month 12) and 85 percent (Month 18) as IE technicians apply RPW, LCR and Kilbridge-Wester balancing and trained supervisors cut daily time-to-target by nearly 15 minutes per shift. [S20] [S31] **M02 (Overall Equipment Effectiveness, OEE)** multiplies Availability, Performance and Quality, progressing from 60 percent at Gate 1 to 72 percent at Gate 2 and 78 percent in Phase 3, avoiding CICAM's 10.83 to 48.9 percent utilisation drop. [R12] **M03 (Mechanic Mean Time to Repair, MTTR)** tracks minutes from station alert through diagnosis, repair (or 5-percent standby head swap) and stitch test, dropping from 42 minutes to below 22, 18 and 14 minutes across Phases 1 to 3. [S38] [S39]

14.17 QUALITY AND DELIVERY METRICS (M04, M05, M06 AND M07) ENFORCE RIGHT-FIRST-TIME EXECUTION AND ACTION CLOSURE

Tracked hourly in the Quality Log, **M04 (Defects per Hundred Units, DHU)** and **M05 (First-Pass Yield, FPY)** pair inline TLS checks with edge vision (above 90 percent accuracy across 40+ defect types versus 60 to 70 percent manual accuracy) to cut DHU from 18.5 to below 6.5, 4.5 and 3.5 while lifting FPY from 82 percent to 93, 95 and 97 percent. [R29] [S21] [S37] **M06 (On-Time-In-Full Delivery, OTIF)** tracks orders passing AQL 1.5/2.5 inspection and shipping on date (88 to 96 percent), while **M07 (Huddle and CAPA On-Time Closure)** requires 85 to 95 percent of root-cause fixes to close on time. [S25] [S26]

14.18 COST, PEOPLE, CAPABILITY AND SUSTAINABILITY METRICS (M08 TO M12) LOCK WORKFORCE HEALTH TO FINANCIAL RETURN

M08 (Effective Labour Cost Index per Good SAM) divides direct payroll (XAF 43,969 floor plus 1.2x overtime and bonuses), supervisory payroll and amortised dojo costs by good SAM earned, converging from an illustrative 1.85x target at Month 1 to 1.25x (Month 6), 1.08x (Month 12) and 1.00x (Month 18) as local supervisors replace expatriate overhead. [R14] [R16] [S10] [S11] [S28] **M09 (Daily Absenteeism)** and **M10 (Annualised Turnover)** verify that Better Work SST coaching, ILO safety rules, midday meals and banded pay hold absenteeism below 3.0 to 4.5 percent and cut turnover from 45 percent to below 12 to 20 percent. [S20] [S24] [S27] [S40] **M11 (3-by-3 Skill-Matrix Coverage and Local Share)** requires 75, 85 and 92 percent of stations to have three Level-L+ operators while local supervisor share hits 100 percent at Month 18. [S09] [S36] **M12 (Measured Water, Energy and Waste per Garment)** meters kWh, litres and marker scrap per unit, targeting an illustrative 20 percent reduction by Month 18. [S21] [S40]

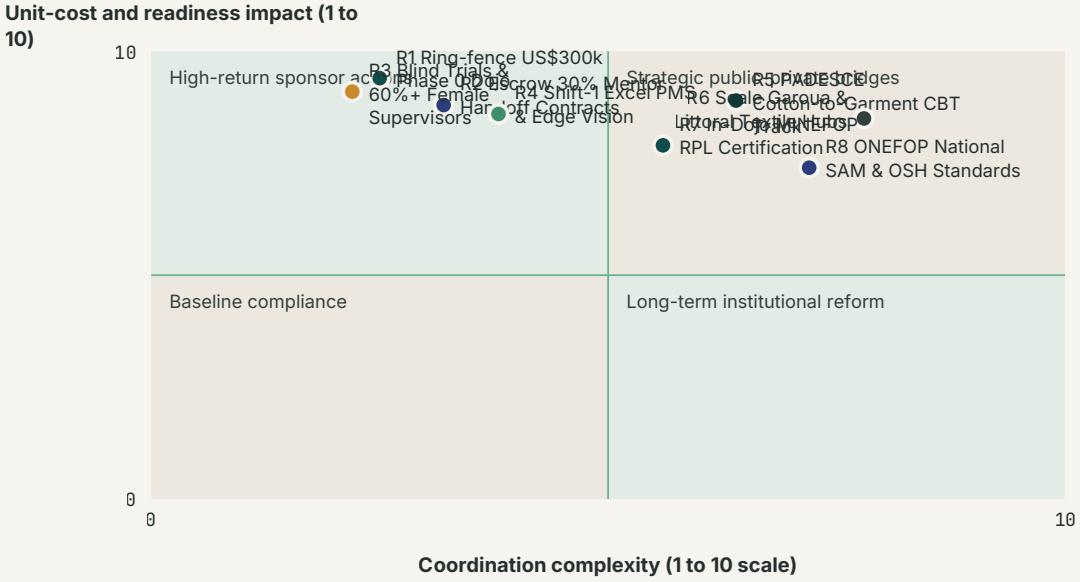
14.19

Private garment sponsors and industrial-park operators must fund capability before commissioning lines

GFT translates this paper's evidence into eight recommendations: four for private garment sponsors and park operators (R1 to R4) and four for Cameroonian TVET authorities and development partners (R5 to R8) (see **Exhibit 61**, p. 223). [R14] [S01] [S20]

EXHIBIT 61 / COMPLEXITY VS IMPACT SCORE (1 TO 10 SCALE)

Actionable recommendations matrix for private garment sponsors, industrial-park operators and Cameroonian TVET authorities



DERIVED [R06] [R07] [R10] [R14] [S01] [S17] [S18] [S19] [S20] [S33] [S40] [S42] Eight structured recommendations (R1 to R4 for private sponsors; R5 to R8 for MINEFOP, MINESEC, ONEFOP and development partners) plotted by implementation coordination effort (x-axis) and unit-cost/capability impact (y-axis). Positions are illustrative analytical scores derived from cited programme evidence.

14.20 RECOMMENDATION 1: RING-FENCE PRE-OPERATING PHASE 0 CAPITAL FOR THE VESTIBULE DOJO AND COHORT-1 STIPENDS

Sponsors of a 3.0-million-garment, 900-person venture must ring-fence an illustrative US$250,000 to US$350,000 (about XAF 150 million to XAF 210 million at ~600 XAF per US dollar; US$300,000 / XAF 180 million central estimate net of vouchers) at Month -4. [R32] [S17] This funds the 30-station Vestibule Dojo and gauges (US$48,000), four months of XAF 43,969 stipends for Cohort-1 trainees and 3 instructors (US$36,000), and 8 mentors over a 14-month average tenure (US$246,000 gross, less US$30,000 in PADESCE vouchers). [R14] [S17] [S35] Amortised over 9.0 million garments, this US$0.033-per-unit outlay protects US$0.42 to US$0.75 per garment in avoided underutilisation and rework. [S20] [S21] [S31]

14.21 RECOMMENDATION 2: CONTRACT EXPATRIATE SPECIALISTS STRICTLY AS TIME-BOUND MENTORS WITH ESCROWED HANDOFF BONUSES

To prevent permanent expatriate overhead and glass ceilings, cap foreign hiring at 6 to 10 practitioners (8 in GFT's model) on 12-to-18-month contracts under the **1-to-3 Shadowing Protocol**. [S09] [S10] [S24] Hold 30 percent of each mentor's pay in escrow, releasing at Months 12 and 18 only when the mentor's three local deputies pass blind balancing, MTTR and huddle exams and hold target OEE and FPY for 60 shifts solo. [S02] [S31] [S38]

14.22 RECOMMENDATION 3: MANDATE BLIND VESTIBULE DIAGNOSTIC TRIALS AND GENDER-BALANCED SUPERVISORY COHORTS

Because nearly 80 percent of operators are women while 95 percent of untrained supervisors are men, and subjective manager rankings misallocate training (low-ranked trainees still gain over 11 percent productivity), replace subjective promotions with a blind two-day Week-4 dojo simulation and Assistant Line Leader trials, mandating at least 60 percent female supervisory intake to capture the 22 percent productivity surge on lines led by SST-trained women. [S01] [S02] [S03] [S20] [S23]

14.23 RECOMMENDATION 4: DEPLOY THE VALIDATED EXCEL PMS SPINE AND TIER-1 EDGE COMPUTER VISION ON SHIFT 1

Run the Line Log, Quality Log, Skill Matrix and edge vision cameras (above 90 percent accuracy across 40+ defect types) from Shift 1 alongside Better Work's 15-day framework and GFT's 120-hour syllabus, cutting time-to-target by nearly 15 minutes per shift, cutting rework by 12 percent, and building the 6-to-12-month history needed for Phase 2 ML forecasting. [R27] [R29] [S20] [S21] [S36] [S1402]

14.24

Cameroonian TVET policymakers, MINEFOP and development partners can institutionalise the factory qualification bridge

Scaling Cameroon's cotton sector from 5 percent local processing to the 50 percent SND30 target by 2030 (including the US$300 million / 180 billion XAF Camtext SA project targeting 12,000 tonnes of fibre and 15,000 jobs at Dibamba and Garoua by 2033, and the SODECOTON-CICAM pole) requires bridging a fragmented TVET system (MINESEC, MINESUP, MINEFOP) that gets 12.5 percent of the CFAF 657.9 billion education budget and trains 5.3 percent of informal workers. [R06] [R07] [R08] [R09] [R10] [S15] [S42]

14.25 RECOMMENDATION 5: ESTABLISH A DEDICATED COTTON-TO-GARMENT INDUSTRIAL CBT TRACK UNDER WORLD BANK PADESCE VOUCHERS

MINEFOP, MINESEC and GICAM should open a **Cotton-to-Garment CBT Window** under the World Bank Secondary Education and Skills Development Project (PADESCE, P170561 / PAD3439 of EUR 112.4 million, or US$125 million in the World Bank's active Cameroon portfolio as of September 2026, with nearly 3,000 vouchers issued), co-financing 15-to-20-day dual-apprenticeship modules inside accredited factory dojos under Law No. 2018/010. [S17] [S18] [S42] [S1401]

14.26 RECOMMENDATION 6: SCALE NORTHERN GAROUA AND LITTORAL TEXTILE TRAINING CENTRES AHEAD OF THE 2030 SND30 RAMP

To address rural underemployment (85.8 percent), rural poverty (56.8 percent) and lower rural vocational exposure (20 percent versus 40 percent urban), pair Garoua centres such as Gaaraadji (training young women at FCFA 5,000 / US$8.90 a month) and regional MINEFOP CRVTs with SODECOTON and CICAM Garoua in the North while adding IE and servo tracks at MINESUP IUTs and MINEFOP CVEs on the Douala-Dibamba corridor to certify 1,500+ supervisors and technicians by 2030. [R03] [R07] [R10] [R12] [S33] [S42]

14.27 RECOMMENDATION 7: OPERATIONALISE IN-DOJO RECOGNITION OF PRIOR LEARNING (RPL) EXAMINATIONS FOR INFORMAL TAILORS AND MECHANICS

Because 66.9 percent of informal workers are self-taught and 24.4 percent trained in small workshops while past RPL uptake was tiny (17 candidates in 2016), MINEFOP and the ILO's 2026 RPL expansion should accredit factory Vestibule Dojos as testing sites where self-taught tailors and mechanics earn national DQP and DTS credentials after 90 days of floor service. [S19] [S42]

14.28 RECOMMENDATION 8: PUBLISH OPEN NATIONAL APPAREL SAM, SKILL-MATRIX AND ILO OSH BENCHMARKS THROUGH ONEFOP AND ANOR

Equip ONEFOP and ANOR to publish a bilingual **Cameroon Apparel Operations Reference Pack** integrating the 2022 ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear (Chapters 14 and 15), GSD operation breakdowns, 33-second shirt balances and 40-defect visual lexicons for domestic workshops. [R14] [S21] [S31] [S40] [S42]

> **UNRESOLVED EXTERNAL RISKS AND THE LIMITS OF SHOP-FLOOR ENGINEERING**
>
> Three external boundaries remain. First, Cameroon is ineligible for US AGOA preferences as of 2025, and textiles remain outside the 92.3 percent agreed AfCFTA tariff lines; Phase 1 and 2 cash flows must rely on domestic and CEMAC demand. [R18] [R23] Second, power sags and Douala port lead times require AVR/UPS protection and 90-day euro-pegged CFA franc spare-parts buffers. [R32] [S39] Third, inherited register figures retain their original dates and grades, and all GFT sizing figures (3.0 million garments, 900 staff, US$300,000 budget) are illustrative models requiring project-specific engineering, legal and tax review.

14.29

Closing synthesis: Warp and Signal weaves human supervision through every thread of production

Across Green Future Tech's research and interactive tools, **Warp and Signal** holds that physical production is the warp, operational measurement is the weft, and value is kept where it is measured. In an economy producing 314,455 to over 350,000 tonnes of seed cotton across 220,000+ farmers yet exporting 95 percent raw, cotton fibre and sewing machines form the warp. [R01] [R02] [R03] [R06] Without the weft of trained local supervisors, IE technicians, mechanics and QA leads rebalancing 33-second lines, running inline TLS and edge-vision checks, holding MTTR to 14 minutes and

logging clean numbers into the PMS, that warp frays into underutilisation and rework. [R29] [S04] [S20] [S31] [S36] [S37] [S38] By funding the Phase 0 Dojo, contracting foreign experts as milestone-bound mentors, promoting via blind trials, and gating capital on proven supervisory and data readiness, African factories can turn local cotton and young workforces into durable industrial value. [R14] [S01] [S02] [S20] [S23]

A garment factory scales only as fast as the supervisors who balance its lines and the measurements that verify its yield.

CHAPTER SOURCE NOTES

S06 International Labour Organization (ILO). 2019-08-26.

S24 World Bank. 2012.

R14 WageIndicator. Publication date unrecorded; inherited source-text check.

R17 just-style. Publication date unrecorded; inherited source-text check.

S11 Roskilde University Centre for African Economies (CAE). 2017.

S28 Center for Global Development (Working Paper 466 via RePEc). 2017-10-15.

R11 Business in Cameroon; MMI News. Publication date unrecorded; inherited source-text check.

R12 Business in Cameroon. Publication date unrecorded; inherited source-text check.

R13 Business in Cameroon; MMI News. Publication date unrecorded; inherited source-text check.

S08 International Labour Organization (ILO). 2019-08-26.

S31 Hawassa University (Ethiopian Journal of Engineering and Technology). 2023.

S17 Cameroon Ministry of Employment and Vocational Training (MINEFOP / JEME). 2025.

S18 World Bank (International Development Association). 2020-07.

S42 International Labour Organization (ILO). 2020.

S12 Roskilde University Centre for African Economies (CAE). 2017.

R06 Cameroon Trade Hub. Publication date unrecorded; inherited source-text check.

R07 Ecofin Agency. Publication date unrecorded; inherited source-text check.

S20 ILO and IFC Better Work. 2016-09.

S35 Online Clothing Study. 2019.

R10 Ecofin Agency. Publication date unrecorded; inherited source-text check.

R27 McKinsey, The State of Fashion 2025. Publication date unrecorded; inherited source-text check.

R29 MDPI; industry inspection literature. Publication date unrecorded; inherited source-text check.

R31 arXiv 2509.04705. Publication date unrecorded; inherited source-text check.

R01 Business in Cameroon. Publication date unrecorded; inherited source-text check.

R02 Fibre2Fashion; Business in Cameroon. Publication date unrecorded; inherited source-text check.

R03 SODECOTON. Publication date unrecorded; inherited source-text check.

S33 AllAfrica / Inter Press Service. 2026-09-03.

R32 Wise; XE. Publication date unrecorded; inherited source-text check.

S09 Open African Innovation Research (OpenAIR). 2021-02-17.

S10 Open African Innovation Research (OpenAIR). 2021-02-17.

S07 International Labour Organization (ILO). 2019-08-26.

R18 Congressional Research Service IF10149; AGOA (Wikipedia). Publication date unrecorded; inherited source-text check.

R24 Mordor Intelligence. Publication date unrecorded; inherited source-text check.

R25 Market.us. Publication date unrecorded; inherited source-text check.

R26 Statista. Publication date unrecorded; inherited source-text check.

S37 Fibre2Fashion. 2013.

S04 National Bureau of Economic Research (NBER). 2019-05.

S36 Online Clothing Study. 2012-03-03.

R23 MacMap; AfCFTA. Publication date unrecorded; inherited source-text check.

S22 Better Work (ILO and IFC). 2016-09-26.

S21 International Labour Organization (ILO). 2024-12-05.

R30 Design Journal (Taylor and Francis). Publication date unrecorded; inherited source-text check.

S25 National Bureau of Economic Research (NBER). 2011-01.

S26 Innovations for Poverty Action (IPA). 2013.

S38 IBM. 2024.

R09 Ecofin Agency. Publication date unrecorded; inherited source-text check.

S01 University of Warwick Department of Economics (RePEc). 2015.

S39 TextileSchool. 2025.

R16 WageIndicator. Publication date unrecorded; inherited source-text check.

S02 National University of Singapore Department of Economics (STITCH). 2021-10.

S27 American Economic Association (AEJ: Applied Economics). 2018-07.

S15 UNESCO, World Bank and International Labour Organization. 2023-07-13.

S41 Cameroon Economic Policy Institute (CEPI). 2024.

S40 International Labour Organization (ILO). 2022.

R28 DataIntelo. Publication date unrecorded; inherited source-text check.

S19 International Labour Organization (ILO). 2026.

S03 National University of Singapore Department of Economics (STITCH). 2021-10.

S23 International Labour Organization (ILO). 2016-09-26.

S1402 Better Work (ILO and IFC). 2022-11-07.

R08 Business in Cameroon. Publication date unrecorded; inherited source-text check.

S1401 World Bank Group. 2026-10-28.

Provenance travels with the claim.

Available inherited records and all chapter-local source records are graded below. Identical source identities are consolidated without losing citation aliases. Missing annex references are excluded. Unrecorded dates are disclosed rather than invented.

R01 Inherited evidence R01 GRADE C

Business in Cameroon. Publication date unrecorded. businessincameroon.com

Cameroon seed-cotton production 2022-2024: 330,000 t (2022), 314,455 t (2023), about 340,000 t (2024).

Inherited source-text check; original source not independently re-opened for this edition.

R02 Inherited evidence R02 GRADE C

Fibre2Fashion; Business in Cameroon. Publication date unrecorded. fibre2fashion.com; businessincameroon.com

2025 seed-cotton projection above 350,000 t.

Inherited source-text check; original source not independently re-opened for this edition.

R03 Inherited evidence R03 GRADE C

SODECOTON. Publication date unrecorded. sodecoton.cm

Company profile: more than 220,000 cotton producers supported in northern Cameroon; nine ginning plants; two oil mills.

Inherited source-text check; original source not independently re-opened for this edition.

R04 Inherited evidence R04 GRADE C

Financial Fortune Media. Publication date unrecorded. financialfortunemedia.com

Source metadata retained for traceability. This entry is not cited in the chapter text.

Inherited source-text check; original source not independently re-opened for this edition.

R05 Inherited evidence R05 GRADE C

Ecofin Agency. Publication date unrecorded. ecofinagency.com

Source metadata retained for traceability. This entry is not cited in the chapter text.

Inherited source-text check; original source not independently re-opened for this edition.

R06 Inherited evidence R06 GRADE C

Cameroon Trade Hub. Publication date unrecorded. cameroontradehub.cm

About 95 percent of cotton fibre exported raw against 5 percent processed locally; industrialisation target of 50 percent local processing.

Inherited source-text check; original source not independently re-opened for this edition.

R07 Inherited evidence R07 GRADE C

Ecofin Agency. Publication date unrecorded. ecofinagency.com

SND30 restates the 50 percent local-processing target by 2030.

Inherited source-text check; original source not independently re-opened for this edition.

R08 Inherited evidence R08 GRADE C

Business in Cameroon. Publication date unrecorded. businessincameroon.com

Announced SODECOTON and CICAM merger to create a cotton-textile industrial pole targeted by 2030.

Inherited source-text check; original source not independently re-opened for this edition.

R09 Inherited evidence R09 GRADE C

Ecofin Agency. Publication date unrecorded. ecofinagency.com

Camtext SA integrated cotton-to-textile project, US$300 million (180 billion XAF); Panafritex and Arise with SODECOTON, CNPS and Marlo; 12 November 2025.

Inherited source-text check; original source not independently re-opened for this edition.

R10 Inherited evidence R10 GRADE C

Ecofin Agency. Publication date unrecorded. ecofinagency.com

Camtext SA: 12,000 t a year processed; about 12,000 jobs at the Dibamba hub and 3,000 at Garoua; return on investment near 11 years; optimal capacity around 2033.

Inherited source-text check; original source not independently re-opened for this edition.

R11 Inherited evidence R11 GRADE C

Business in Cameroon; MMI News. Publication date unrecorded. businessincameroon.com; mimimefoinfos.com

CICAM market share from about 85 percent three decades ago to about 5 percent today.

Inherited source-text check; original source not independently re-opened for this edition.

R12 Inherited evidence R12 GRADE C

Business in Cameroon. Publication date unrecorded. businessincameroon.com

CICAM capacity utilisation, July 2023 report: Garoua 33.7 percent, CICAM 1 48.9 percent, CICAM 2 10.83 percent; underutilisation cost about CFAF 2 billion in 2020.

Inherited source-text check; original source not independently re-opened for this edition.

R13 Inherited evidence R13 GRADE C

Business in Cameroon; MMI News. Publication date unrecorded. businessincameroon.com; mimimefoinfos.com

CICAM restructuring cost estimate CFAF 30.7 to 48.2 billion; one relaunch plan cited at 70.2 billion.

Inherited source-text check; original source not independently re-opened for this edition.

R14 Inherited evidence R14 GRADE C

WageIndicator. Publication date unrecorded. wageindicator.org

Cameroon minimum wage (SMIG) XAF 41,875 a month in 2023, raised to XAF 43,969 a month from 23 February 2024, about US$76, a rise of 5 percent.

Inherited source-text check; original source not independently re-opened for this edition.

R15 Inherited evidence R15 GRADE C

wage.is. Publication date unrecorded. wage.is/cameroon

Average salary across sectors in Cameroon about US$359 a month.

Inherited source-text check; original source not independently re-opened for this edition.

R16 Inherited evidence R16 GRADE C

WageIndicator. Publication date unrecorded. wageindicator.org

Informal share of employment about 90 percent; standard 40-hour week, 48-hour maximum, overtime at 1.2 times.

Inherited source-text check; original source not independently re-opened for this edition.

R17 Inherited evidence R17 GRADE C

just-style. Publication date unrecorded. just-style.com

Cambodia garment-sector minimum wage US$204 a month for 2024 (labour-cost benchmark).

Inherited source-text check; original source not independently re-opened for this edition.

R18 Inherited evidence R18 GRADE B

Congressional Research Service IF10149; AGOA (Wikipedia). Publication date unrecorded. congress.gov; en.wikipedia.org

AGOA: Cameroon terminated effective 1 January 2020 for gross human-rights violations; remained ineligible; listed ineligible for calendar year 2025.

Inherited source-text check; original source not independently re-opened for this edition.

R23 Inherited evidence R23 GRADE C

MacMap; AfCFTA. Publication date unrecorded. macmap.org

Textiles and clothing among unresolved AfCFTA tariff-line categories; 92.3 percent of lines agreed excluding vehicles, textiles and clothing.

Inherited source-text check; original source not independently re-opened for this edition.

R24 Inherited evidence R24 GRADE C

Mordor Intelligence. Publication date unrecorded. mordorintelligence.com

Africa textile market about US$37.3 billion in 2025, projected US$49.41 billion by 2030 at 4.73 percent a year.

Inherited source-text check; original source not independently re-opened for this edition.

R25 Inherited evidence R25 GRADE C

Market.us. Publication date unrecorded. market.us

Africa textile market to about US$72.7 billion by 2035 at 6.9 percent a year; fashion and apparel 48.1 percent of the market in 2024.

Inherited source-text check; original source not independently re-opened for this edition.

R26 Inherited evidence R26 GRADE C

Statista. Publication date unrecorded. statista.com

Cameroon clothing and footwear spend about US$94.70 a person in 2024 and about 8.0 pieces a person; apparel eCommerce revenue US$20.32 million (2023) to US$33.61 million (2027) at 13.41 percent a year; user penetration 18.0 percent (2023) to 22.7 percent (2027).

Inherited source-text check; original source not independently re-opened for this edition.

R27 Inherited evidence R27 GRADE B

McKinsey, The State of Fashion 2025. Publication date unrecorded. mckinsey.com

AI at scale in fashion: inventory cost down 35 to 40 percent; forecast accuracy up 20 to 30 percent; revenue per customer up 15 to 25 percent; forecast errors cut 20 to 50 percent; lost sales down up to 65 percent; 75 percent of executives prioritising; sector operating-profit potential US$150 to 275 billion over three to five years.

Inherited source-text check; original source not independently re-opened for this edition.

R28 Inherited evidence R28 GRADE C

DataIntelo. Publication date unrecorded. dataintelo.com

Fabric-defect-detection AI market US$523.4 million (2024) to US$6,522.1 million (2033) at 33.8 percent a year; Asia-Pacific about 46 percent in 2024.

Inherited source-text check; original source not independently re-opened for this edition.

R29 Inherited evidence R29 GRADE C

MDPI; industry inspection literature. Publication date unrecorded. mdpi.com

Manual defect inspection 60 to 70 percent accurate, missing 20 to 30 percent of defects; computer vision above 90 percent across more than 40 defect types; line-scan inspection up to 60 metres a minute.

Inherited source-text check; original source not independently re-opened for this edition.

R30 Inherited evidence R30 GRADE C

Design Journal (Taylor and Francis). Publication date unrecorded. tandfonline.com

Generative AI in apparel 2023-2024 mainly design-side image generation (Midjourney, Stable Diffusion) across style, silhouette, colour and pattern.

Inherited source-text check; original source not independently re-opened for this edition.

R31 Inherited evidence R31 GRADE C

arXiv 2509.04705. Publication date unrecorded. arxiv.org/abs/2509.04705

By 2025-2026 the field moved to multi-model garment-design pipelines (fabric construction, shade, weave, silhouette) and physics-constrained generation coupling neural generation with simulation validation.

Inherited source-text check; original source not independently re-opened for this edition.

R32 Inherited evidence R32 GRADE C

Wise; XE. Publication date unrecorded. wise.com; xe.com

CFA franc to US dollar reference rates; franc pegged to the euro at 655.957. The GFT study's method note places the franc near 590 to 610 per US dollar across the 2023 study window and near 563 to 577 more recently, and treats currency conversions as estimates.

Inherited source-text check; original source not independently re-opened for this edition.

c01-S02 (Mis)allocation of Managerial Training Within the Firm GRADE B

National University of Singapore Department of Economics. 2021-10-06. https://fass.nus.edu.sg/ecs/wp-content/uploads/sites/4/2021/10/AGMN_STITCH_oct2021..pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c01-S04 Management and Shocks to Worker Productivity GRADE B

National Bureau of Economic Research. 2019-05. https://www.nber.org/papers/w25865

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c01-S05 The effects of automation in the apparel and footwear industries and their gender dimensions: Indonesia case study GRADE A

International Labour Organization. 2024-05-15. https://www.ilo.org/media/544751/download

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c01-S06 Skills for Trade and Economic Diversification in Ethiopia: A background paper for drafting of a Sector Skills Strategy for the Garment sector in Ethiopia GRADE A

International Labour Organization. 2019-08-26. https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_emp/@ifp_skills/documents/publication/wcms_850892.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c01-S11 Made in Ethiopia: The Emergence and Evolution of the Ethiopian Apparel Export Sector GRADE B

Roskilde University Centre for African Economies. 2017. https://rucforsk.ruc.dk/ws/files/61126066/CAE_WP3_Made_in_Ethiopia.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c01-S20 Progress and Potential: How Better Work is improving garment workers' lives and boosting factory competitiveness GRADE A

International Labour Organization and International Finance Corporation Better Work. 2016. https://betterwork.org/wp-content/uploads/BW-Progress-and-Potential_Web-final.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c01-S21 SCORE Project: ILO presents the impacts on productivity and working conditions in SMEs in Brazil's Garment Sector GRADE A

International Labour Organization. 2024-12-05. https://www.ilo.org/resource/article/score-project-ilo-presents-impacts-productivity-and-working-conditions-smes

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c01-S25 Does Management Matter? Evidence from India GRADE B

National Bureau of Economic Research. 2011-01. https://www.nber.org/system/files/working_papers/w16658/w16658.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c01-S26 Does Management Matter? Evidence from India GRADE B

Innovations for Poverty Action. 2013-02-03. https://poverty-action.org/publication/does-management-matter-evidence-india

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c01-S28 Can Africa Be a Manufacturing Destination? Labor Costs in Comparative Perspective GRADE B

Center for Global Development. 2017-10-15. https://econpapers.repec.org/RePEc:cgd:wpaper:466

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c01-S29 Industrialization in Africa must compete, connect, and create value GRADE B

World Bank Blogs. 2025-11-19. https://blogs.worldbank.org/en/africacan/industrialization-in-africa-must-compete-connect-and-create-value

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c01-S30 Africa's Manufacturing Puzzle: Evidence from Tanzanian and Ethiopian Firms GRADE B

The World Bank Economic Review, Oxford University Press. 2025. https://documents1.worldbank.org/curated/en/099155005022535017/pdf/IDU-b676631d-b40c-4328-919a-6743b99efdae.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c02-S02 (Mis)allocation of Managerial Training Within the Firm GRADE B

National University of Singapore Department of Economics (STITCH). 2021-10. https://fass.nus.edu.sg/ecs/wp-content/uploads/sites/4/2021/10/AGMN_STITCH_oct2021..pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c02-S03 (Mis)allocation of Managerial Training Within the Firm (Heterogeneity Analysis) GRADE B

National University of Singapore Department of Economics (STITCH). 2021-10. https://fass.nus.edu.sg/ecs/wp-content/uploads/sites/4/2021/10/AGMN_STITCH_oct2021..pdf#page=2

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c02-S06 Same source record as c01-S06.

c02-S07 Skills for Trade and Economic Diversification in Ethiopia: Industrial Park Skills Assessment GRADE A

International Labour Organization (ILO). 2019-08-26. https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_emp/@ifp_skills/documents/publication/wcms_850892.pdf#page=25

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c02-S08 Skills for Trade and Economic Diversification in Ethiopia: Occupational Structure of Garment Firms GRADE A

International Labour Organization (ILO). 2019-08-26. https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_emp/@ifp_skills/documents/publication/wcms_850892.pdf#page=24

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c02-S12 Made in Ethiopia: Industrial Conditioning of First-Generation Factory Workers GRADE B

Roskilde University Centre for African Economies (CAE). 2017. https://rucforsk.ruc.dk/ws/files/61126066/CAE_WP3_Made_in_Ethiopia.pdf#page=14

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c02-S20 Progress and Potential: How Better Work is improving garment workers' lives and boosting factory competitiveness GRADE A

ILO and IFC Better Work. 2016-09. https://betterwork.org/wp-content/uploads/BW-Progress-and-Potential_Web-final.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c02-S24 Lao PDR: Labour standards and productivity in the garments export sector (Report No. 70809-LA) GRADE A

World Bank. 2012. https://documents1.worldbank.org/curated/en/695111468045568160/pdf/708090REVISED00Garment0Report0FINAL.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c02-S27 The Impacts of Industrial and Entrepreneurial Work on Income and Health: Experimental Evidence from Ethiopia GRADE B

American Economic Association (AEJ: Applied Economics). 2018-07. https://www.aeaweb.org/articles?id=10.1257/app.20170173

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c02-S31 Sewing Line Efficiency Improvement Using Line Balancing Methods for Case of JP Garment GRADE B

Hawassa University (Ethiopian Journal of Engineering and Technology). 2023. https://journals.hu.edu.et/hu-journals/index.php/ejet/article/download/931/393

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c02-S41 Preparing Youth for the Job Market GRADE B

Cameroon Economic Policy Institute (CEPI). 2024. https://camepi.org/preparing-youth-for-the-job-market/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c02-S42 State of Skills: Cameroon GRADE A

International Labour Organization (ILO). 2020. https://researchrepository.ilo.org/view/pdfCoverPage?instCode=41ILO_INST&filePid=13131940540002676&download=true

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c03-S01 Challenges of Change: An Experiment Training Women to Manage in the Bangladeshi Garment Sector GRADE B

University of Warwick Department of Economics (RePEc). 2015. https://ideas.repec.org/p/wrk/warwec/1100.html

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c03-S02 Same source record as c02-S02.

c03-S03 Same source record as c02-S03.

c03-S06 Same source record as c01-S06.

c03-S09 Foreign Direct Investment (FDI) and Learning in Ethiopia's Textile and Garment Sector (Working Paper 25) GRADE B

Open African Innovation Research (OpenAIR). 2021-02-17. https://openair.africa/wp-content/uploads/2021/02/WP-25-FDI-and-Learning-in-Ethiopias-Textile-and-Garment-Sector.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c03-S10 Foreign Direct Investment (FDI) and Learning in Ethiopia's Textile and Garment Sector: Cost of Foreign Technicians GRADE B

Open African Innovation Research (OpenAIR). 2021-02-17. https://openair.africa/wp-content/uploads/2021/02/WP-25-FDI-and-Learning-in-Ethiopias-Textile-and-Garment-Sector.pdf#page=10

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c03-S11 Made in Ethiopia: The Emergence and Evolution of the Ethiopian Apparel Export Sector (CAE Working Paper 2017:3) GRADE B

Roskilde University Centre for African Economies (CAE). 2017. https://rucforsk.ruc.dk/ws/files/61126066/CAE_WP3_Made_in_Ethiopia.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c03-S13 Researching Chinese Firms and Employment Dynamics in Sub-Saharan Africa GRADE B

SOAS University of London (IDCEA Project). 2018. https://www.soas.ac.uk/sites/default/files/2023-01/IDCEA%20Research%20design%20and%20concept%20paper.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c03-S20 Same source record as c02-S20.

c03-S22 Improving the garment industry through supervisors GRADE A

Better Work (ILO and IFC). 2018. https://betterwork.org/improving-the-garment-industry-through-supervisors/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c03-S23 Progress and potential: Improved working conditions in the apparel industry make workers' lives better and businesses stronger GRADE A

International Labour Organization (ILO). 2016-09-26. https://www.ilo.org/resource/news/progress-and-potential-improved-working-conditions-apparel-industry-make

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c03-S24 Same source record as c02-S24.

c03-S27 Same source record as c02-S27.

c03-S42 Same source record as c02-S42.

c04-S02 Same source record as c01-S02.

c04-S21 Same source record as c01-S21.

c04-S22 Improving the garment industry through supervisors GRADE A

Better Work (ILO and IFC). 2016-09-26. https://betterwork.org/improving-the-garment-industry-through-supervisors/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c04-S23 Progress and potential: Improved working conditions in the apparel industry make workers' lives better and businesses stronger GRADE A

International Labour Organization (ILO). 2016-10-06. https://www.ilo.org/resource/news/progress-and-potential-improved-working-conditions-apparel-industry-make

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c04-S31 Same source record as c02-S31.

c04-S32 Line Balancing in the Modern Garment Industry (arXiv:2502.00455) GRADE B

arXiv / City University of Hong Kong. 2025-02-14. https://arxiv.org/pdf/2502.00455

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c05-S06 Same source record as c01-S06.

c05-S31 Sewing Line Efficiency Improvement Using Line Balancing Methods for Case of JP Garment GRADE B

Hawassa University (Ethiopian Journal of Engineering and Technology). 2023-10-20. https://journals.hu.edu.et/hu-journals/index.php/ejet/article/download/931/393

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c05-S32 Line Balancing in the Modern Garment Industry (arXiv:2502.00455) GRADE B

Authors via arXiv. 2025-02-14. https://arxiv.org/abs/2502.00455

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c05-S40 Safety and health in textiles, clothing, leather and footwear: ILO code of practice GRADE A

International Labour Organization (ILO). 2022. https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_dialogue/@sector/documents/normativeinstrument/wcms_828429.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c05-S0501 Time and Method Study Analysis to Improve Productivity of Shirt Manufacturing for Case of JP Garment

GRADE B

Hawassa University, Ethiopian Journal of Engineering and Technology. 2024-06-20. https://journals.hu.edu.et/hu-journals/index.php/ejet/article/view/1288

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S05 The effects of automation in the apparel and footwear industries and their gender dimensions: Indonesia (Background Paper No. 20)

GRADE B

International Labour Organization (ILO). 2022. https://www.ilo.org/media/544751/download

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S06 Same source record as c01-S06.

c06-S08 Same source record as c02-S08.

c06-S09 Same source record as c03-S09.

c06-S10 Same source record as c03-S10.

c06-S16 Strengthening TVET System in Cameroon: Recommendations for Bridging the Gap Between Education and Industry

GRADE B

North American Academic Research (TWASP). 2021. https://twasp.info/public/paper/NADEGE%20KOBA.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S17 MINEFOP Steps Up Vocational Training Reforms to Connect Skills with Jobs

GRADE A

Cameroon Ministry of Employment and Vocational Training (MINEFOP / JEME). 2025. https://emploijeune.cm/en/news/posts/25/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S18 Cameroon Secondary Education and Skills Development Project Appraisal Document (Report No. PAD3439, P170561)

GRADE A

World Bank (International Development Association). 2020-07. https://documents1.worldbank.org/curated/en/913591595210515945/pdf/Cameroon-Secondary-Education-and-Skills-Development-Project.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S19 Cameroon lays foundation for recognizing skills gained through labour-based public works

GRADE B

International Labour Organization (ILO). 2026. https://www.ilo.org/resource/news/cameroon-lays-foundation-recognizing-skills-gained-through-labour-based

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S20 Same source record as c02-S20.

c06-S21 SCORE Project: ILO presents the impacts on productivity and working conditions in SMEs in Brazil's Garment Sector GRADE B

International Labour Organization (ILO). 2024. https://www.ilo.org/resource/article/score-project-ilo-presents-impacts-productivity-and-working-conditions-smes

Source metadata retained for traceability. This entry is not cited in the chapter text.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S25 Does Management Matter? Evidence from India (NBER Working Paper 16658) GRADE B

National Bureau of Economic Research (NBER). 2011-01. https://www.nber.org/system/files/working_papers/w16658/w16658.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S26 Does Management Matter? Evidence from India (QJE Evaluation Summary) GRADE B

Innovations for Poverty Action (IPA). 2013. https://poverty-action.org/publication/does-management-matter-evidence-india

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S31 Same source record as c02-S31.

c06-S32 Line Balancing in the Modern Garment Industry (arXiv:2502.00455) GRADE B

arXiv / City University of Hong Kong. 2025-02. https://arxiv.org/pdf/2502.00455

Source metadata retained for traceability. This entry is not cited in the chapter text.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S34 Cameroon Industrial Cotton Corporation (CICAM) Profile GRADE B

Societe Nationale d'Investissement du Cameroun (SNI). 2024. https://www.sni.cm/index.php/en/secondary-sector-en/94-cameroon-industrial-cotton-corporation.html

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S35 Operator Training and Deployment in Apparel Industry - A Systemic View GRADE C

Online Clothing Study. 2019. https://onlineclothingstudy.com/sewing-operator-training-and-deployment/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S36 What is Skill Matrix for Sewing Operator? GRADE C

Online Clothing Study. 2012-03-03. https://onlineclothingstudy.com/what-is-skill-matrix-for-sewing/

Source metadata retained for traceability. This entry is not cited in the chapter text.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S37 Traffic Light System for Quality Inspection in Garment Industry GRADE C

Fibre2Fashion. 2013. https://www.fibre2fashion.com/industry-article/6990/traffic-light-system

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S38 What is Mean Time to Repair (MTTR)? GRADE B

IBM. 2024. https://www.ibm.com/think/topics/mttr

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S39 Textile Machinery Maintenance and Downtime Calculations GRADE C

TextileSchool. 2025-07-22. https://www.textileschool.com/28883/textile-machinery-maintenance-and-downtime-calculations/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S40 Same source record as c05-S40.

c06-S42 Same source record as c02-S42.

c06-S0601 Sewing Machine Maintenance Schedule and the Real Cost of Downtime GRADE C

ORDNUR. 2026-09-08. https://ordnur.com/sewing/sewing-machine-maintenance-schedule/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S0602 Preventive Maintenance of Industrial Sewing Machine GRADE C

Textile Learner (Hindustan University Department of Fashion Design and Arts). 2014-11-22. https://textilelearner.net/preventive-maintenance-of-industrial-sewing-machine/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c06-S0603 Sewing machine servo motor VS clutch motor GRADE C

HighTex / StitchWorld. 2023-08-08. http://hightex-solution.com/blog/Marketing/2023/0808/289.html

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c07-S21 Same source record as c06-S21.

c07-S37 Same source record as c06-S37.

c07-S40 Same source record as c05-S40.

c07-S0701 **ISO 2859-1:2026, Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection** GRADE A

International Organization for Standardization (ISO). 2026-01. https://www.iso.org/obp/ui/en/#!iso:std:85464:en

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

---

c07-S0702 **Fabric Defect Detection Using Modified Local Binary Patterns** GRADE B

Hindawi Publishing Corporation, EURASIP Journal on Advances in Signal Processing. 2008. https://link.springer.com/content/pdf/10.1155/2008/783898.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

---

c08-S15 **Building Better Formal TVET Systems: Principles and Practice in Low- and Middle-Income Countries** GRADE A

UNESCO, World Bank and International Labour Organization. 2023-07-13. https://www.unesco.org/en/articles/new-report-unesco-world-bank-and-ilo-says-technical-and-vocational-education-and-training-must

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

---

c08-S16 **Strengthening TVET System in Cameroon: Recommendations for Bridging the Gap Between Education and Industry** GRADE B

North American Academic Research (TWASP). 2024-12-22. https://twasp.info/public/paper/NADEGE%20KOBA.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

---

c08-S17 **MINEFOP Steps Up Vocational Training Reforms to Connect Skills with Jobs** GRADE A

Cameroon Ministry of Employment and Vocational Training (MINEFOP / JEME). 2026-08-20. https://emploijeune.cm/en/news/posts/25/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

---

c08-S18 Same source record as c06-S18.

---

c08-S19 **Cameroon lays foundation for recognizing skills gained through labour-based public works** GRADE A

International Labour Organization (ILO). 2026-08-04. https://www.ilo.org/resource/news/cameroon-lays-foundation-recognizing-skills-gained-through-labour-based

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

---

c08-S40 Same source record as c05-S40.

---

c08-S42 Same source record as c02-S42.

---

c09-S0901 Same source record as c02-S42.

c09-S0902 Cameroon: Garoua Textile Centre Takes Early Steps To Empower Young Women GRADE C

Bird Story Agency, republished by AllAfrica. 2026-09-03. https://allafrica.com/stories/202609030599.html

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c09-S0903 Lao PDR: Labour standards and productivity in the garments export sector, Report No. 70809-LA GRADE A

World Bank. 2012-07. https://documents1.worldbank.org/curated/en/695111468045568160/pdf/708090REVISED00Garment0Report0FINAL.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c09-S0904 Republic of Cameroon: Priorities for Ending Poverty and Boosting Shared Prosperity, Systematic Country Diagnostic, Report No. 103098-CM GRADE A

World Bank. 2016-06-20. https://documents1.worldbank.org/curated/en/527781467208782508/pdf/103098-SCD-P151164-SecM2016-0193-IDA-SecM2016-0126-IFC-SecM2016-0073-MIGA-SecM2016-0072-Box396255B-OUO-9.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c09-S27 Same source record as c02-S27.

c10-S01 Same source record as c03-S01.

c10-S02 Same source record as c02-S02.

c10-S03 Same source record as c02-S03.

c10-S04 Management and Shocks to Worker Productivity (Working Paper 25865) GRADE B

National Bureau of Economic Research (NBER). 2019-05. https://www.nber.org/papers/w25865

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c10-S05 Same source record as c06-S05.

c10-S06 Same source record as c01-S06.

c10-S07 Same source record as c02-S07.

c10-S08 Same source record as c02-S08.

c10-S09 Same source record as c03-S09.

c10-S11 Same source record as c03-S11.

c10-S12 Same source record as c02-S12.

c10-S17 Same source record as c06-S17.

c10-S18 Same source record as c06-S18.

c10-S19 Same source record as c06-S19.

c10-S20 Same source record as c02-S20.

c10-S21 Same source record as c06-S21.

c10-S22 Same source record as c03-S22.

c10-S23 Same source record as c03-S23.

c10-S24 Same source record as c02-S24.

c10-S27 Same source record as c02-S27.

c10-S31 Same source record as c02-S31.

c10-S32 Same source record as c06-S32.

c10-S33 Cameroon: Garoua Textile Centre Takes Early Steps To Train Young Women GRADE C

AllAfrica / Inter Press Service. 2026-09-03. https://allafrica.com/stories/202609030599.html

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c10-S35 Same source record as c06-S35.

c10-S36 Same source record as c06-S36.

c10-S37 Same source record as c06-S37.

c10-S38 Same source record as c06-S38.

c10-S39 Textile Machinery Maintenance and Downtime Calculations GRADE C

TextileSchool. 2025. https://www.textileschool.com/28883/textile-machinery-maintenance-and-downtime-calculations/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c10-S40 Same source record as c05-S40.

c10-S41 Same source record as c02-S41.

c10-S42 Same source record as c02-S42.

c10-S1001 Progress and Potential: A Focus on Firm Performance (Thematic Brief) GRADE A

ILO and IFC Better Work. 2016-09. https://betterwork.org/wp-content/uploads/Firm-performance-Brief-Finalweb.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c10-S1002 What is Learning Curve in Apparel Manufacturing? GRADE C

Online Clothing Study. 2018-01-05. https://onlineclothingstudy.com/what-is-learning-curve-in-apparel/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c10-S1003 Systematic Training of Sewing Industry Operators - An Introduction GRADE C

Online Clothing Study. 2012-01-02. https://onlineclothingstudy.com/systematic-training-of-sewing-industry/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c10-S1004 How to Develop Skill Matrix? (with Excel Template) GRADE C

Online Clothing Study. 2016-05-09. https://onlineclothingstudy.com/how-to-develop-skill-matrix-with-excel/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c11-S01 Same source record as c03-S01.

c11-S02 Same source record as c02-S02.

c11-S03 Same source record as c02-S03.

c11-S04 Same source record as c10-S04.

c11-S06 Same source record as c01-S06.

c11-S08 Same source record as c02-S08.

c11-S09 Same source record as c03-S09.

c11-S10 Same source record as c03-S10.

c11-S11 Same source record as c03-S11.

c11-S13 Same source record as c03-S13.

c11-S14 Creating Markets in Madagascar for Inclusive Growth: Country Private Sector Diagnostic GRADE A

World Bank and International Finance Corporation (IFC). 2021-12. https://documents1.worldbank.org/curated/en/099703408052215571/pdf/IDU025e9936b0f71804ac80b86c0351ed9d5317e.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c11-S18 Same source record as c06-S18.

c11-S20 Same source record as c02-S20.

c11-S21 Same source record as c06-S21.

c11-S22 Same source record as c03-S22.

c11-S23 Same source record as c03-S23.

c11-S24 Same source record as c02-S24.

c11-S27 Same source record as c02-S27.

c11-S31 Same source record as c02-S31.

c11-S32 Same source record as c06-S32.

c11-S33 Same source record as c10-S33.

c11-S35 Same source record as c06-S35.

c11-S36 Same source record as c06-S36.

c11-S37 Same source record as c06-S37.

c11-S38 Same source record as c06-S38.

c11-S39 Same source record as c10-S39.

c11-S40 Same source record as c05-S40.

c11-S42 Same source record as c02-S42.

c11-S1101 Challenges of Change: An Experiment Promoting Women to Managerial Roles in the Bangladeshi Garment Sector GRADE B

Innovations for Poverty Action (IPA). 2020-07-01. https://poverty-action.org/publication/challenges-change-experiment-promoting-women-managerial-roles-bangladeshi-garment

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c11-S1102 Gender Empowerment and Productivity in the Garment Sector (Project Memo) GRADE B

International Growth Centre (IGC). 2015. https://www.theigc.org/sites/default/files/2016/02/Woodruff-Macchiavello-2015-Project-memo.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c11-S1103 Foreign Direct Investment (FDI) and Learning in Ethiopia's Textile and Garment Sector: Local Management Training Delay GRADE B

Open African Innovation Research (OpenAIR). 2021-02-17. https://openair.africa/wp-content/uploads/2021/02/WP-25-FDI-and-Learning-in-Ethiopias-Textile-and-Garment-Sector.pdf#page=16

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

c12-S01 Same source record as c03-S01.

c12-S02 Same source record as c02-S02.

c12-S03 Same source record as c02-S03.

c12-S04 Same source record as c10-S04.

c12-S06 Same source record as c01-S06.

c12-S08 Same source record as c02-S08.

c12-S09 Same source record as c03-S09.

c12-S10 Same source record as c03-S10.

c12-S11 Same source record as c03-S11.

c12-S12 Same source record as c02-S12.

c12-S14 Same source record as c11-S14.

c12-S17 Same source record as c06-S17.

c12-S18 Same source record as c06-S18.

c12-S20 Same source record as c02-S20.

c12-S21 Same source record as c06-S21.

c12-S22 Same source record as c03-S22.

c12-S23 Same source record as c03-S23.

c12-S24 Same source record as c02-S24.

c12-S25 Same source record as c06-S25.

c12-S26 Same source record as c06-S26.

c12-S27 Same source record as c02-S27.

c12-S28 Same source record as c01-S28.

c12-S31 Same source record as c02-S31.

c12-S33 Same source record as c10-S33.

c12-S35 Same source record as c06-S35.

c12-S36 Same source record as c06-S36.

c12-S37 Same source record as c06-S37.

c12-S38 Same source record as c06-S38.

c12-S39 Same source record as c10-S39.

c12-S40 Same source record as c05-S40.

c12-S42 Same source record as c02-S42.

c12-S1201 **Piece rate pay brings mixed results for garment workers, new study shows** GRADE B

ILO and IFC Better Work. 2018-12-20. https://betterwork.org/piece-rate-pay-brings-mixed-results-for-garment-workers-new-study-shows/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

---

c12-S1202 **Cost of employing someone in Cameroon 2026** GRADE C

Teamed. 2026-10-21. https://www.teamed.global/country-hiring-guides/cameroon/cost-breakdown

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

---

c13-S1301 Same source record as c01-S06.

---

c13-S1302 Same source record as c01-S02.

---

c13-S1303 Same source record as c02-S27.

---

c13-S1304 **New report by UNESCO, World Bank and ILO says Technical and Vocational Education and Training must improve to meet skills and labour mismatch** GRADE A

UNESCO. 2023-08-11. https://www.unesco.org/en/articles/new-report-unesco-world-bank-and-ilo-says-technical-and-vocational-education-and-training-must

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

---

c13-S1305 **Cameroon Secondary Education and Skills Development Project: Project Appraisal Document, Report PAD3439** GRADE A

World Bank, International Development Association. 2020-06-24. https://documents1.worldbank.org/curated/en/913591595210515945/pdf/Cameroon-Secondary-Education-and-Skills-Development-Project.pdf

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

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c13-S1306 **Challenges of Change: An Experiment Training Women to Manage in the Bangladeshi Garment Sector** GRADE B

University of Warwick Department of Economics. 2015-12. https://warwick.ac.uk/fac/soc/economics/research/workingpapers/2015/twerp_1100_woodruff.pdf

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c14-S40 Same source record as c05-S40.

c14-S41 Same source record as c02-S41.

c14-S42 Same source record as c02-S42.

c14-S1401 Cameroon Overview: Development News, Research, Data GRADE A

World Bank Group. 2026-10-28. https://www.worldbank.org/en/country/cameroon/overview

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Accessed 2026-10-30. Quote retained in the machine-readable source record.

c14-S1402 Training - Better Work Factory Improvement Process GRADE B

Better Work (ILO and IFC). 2022-11-07. https://betterwork.org/our-work/training/

Opened source record.

Accessed 2026-10-30. Quote retained in the machine-readable source record.

Stable definitions make comparisons useful.

Acceptable Quality Limit (AQL)

Statistical sampling threshold (typically AQL 1.5 or 2.5 in apparel) defining the maximum percentage of defective garments permitted in an inspected shipment lot before rejection.

Analytical Method of Training (AMT)

Systematic off-line operator training pedagogy that decomposes complex sewing tasks into basic psycho-motor exercises, paper stitching, fabric-handling drills and stamina builds.

Andon Signal

Visual and audible workstation alert system allowing a sewing operator or inline inspector to summon a line supervisor or mechanic immediately when a defect cluster or machine fault occurs.

Autonomous Maintenance

Pillar of Total Productive Maintenance in which sewing operators perform daily lint cleaning, oil-sight checks, needle changes and tension verification before and after each shift.

Balancing Loss

Proportion of available workstation time lost to uneven task durations across a sewing line, equal to one minus line balance efficiency.

Bottleneck Operation

The workstation on a garment assembly line with the longest effective cycle time or lowest capacity, which dictates the maximum throughput of the entire line.

Bundle Ticket

Physical or barcode/RFID routing card accompanying a cut garment bundle that specifies style, size, shade lot, operation sequence and standard minute values.

Capacity Utilisation

Ratio of actual good garments produced over a period to the engineering nameplate capacity of the plant or line.

Centre for Rapid Vocational Training (CRVT)

Accelerated public vocational training structure supervised by Cameroon's Ministry of Employment and Vocational Training (MINEFOP) to deliver short-cycle industrial and office skills.

Centres of Vocational Excellence (CVE)

High-specification public-private vocational training centres established under MINEFOP in Cameroon with international partner support to train technicians and master instructors.

Competency-Based Approach (CPA / CBT)

Curriculum and assessment methodology implemented by Cameroon's MINESEC and MINEFOP that certifies trainees on demonstrated execution of specific industrial tasks rather than classroom seat time.

Corrective and Preventive Action (CAPA)

Closed-loop quality and maintenance discipline recorded in the weekly review log that pairs every recurring defect or breakdown with a root-cause fix, named owner and verification date.

Cut, Make, Trim (CMT)

Core garment manufacturing operating model covering fabric spreading, cutting, sewing assembly, trimming, pressing and packaging.

Cycle Time

Actual elapsed time required by an operator at a workstation to complete one assigned operation on a single garment piece, including material handling and bundle positioning.

Daily Line Huddle

Standing 10-to-15-minute shift-opening review led by the line supervisor at the visual board to examine yesterday's output, defects and downtime and assign today's station fixes.

Defects per Hundred Units (DHU)

Primary garment quality metric calculated as total individual defects found divided by total units inspected, multiplied by 100.

Diplome de Qualification Professionnelle (DQP)

National vocational qualification credential issued by Cameroon's MINEFOP upon passing annual practical and theoretical trade examinations.

Diplome de Technicien Specialise (DTS)

National specialised technician credential awarded by Cameroon's MINEFOP for advanced post-secondary vocational and industrial tracks.

Effective Labour Cost per Unit

Total direct and supervisory payroll, statutory contributions and training amortisation divided by the number of first-pass-yield garments produced.

End-of-Line (EOL) Inspection

Hundred-percent quality check conducted at the exit of a sewing line before pressing and packing, which catches defects late unless paired with inline roving checks.

First-Pass Yield (FPY)

Percentage of garments exiting the sewing line that pass inspection on the first attempt without requiring mending, stain removal or stitch alteration.

General Sewing Data (GSD)

Predetermined motion-time system engineered for the apparel industry that assigns standard time-measurement units to elementary fabric-handling and machine-stitching motions.

ILUO Skill Matrix

Four-tier competency classification grid grading workers from I (trainee under supervision) and L (independent execution) to U (meets target SMV and quality) and O (qualified to coach others).

Inline Roving Inspection

Quality patrol method in which an inspector audits a random sample of 5 to 10 pieces at each sewing machine multiple times per shift to catch defects at the source.

Kilbridge and Wester Method

Heuristic assembly-line balancing algorithm that groups operations into precedence columns and assigns tasks to workstations to minimise idle time within a target cycle time.

Largest Candidate Rule (LCR)

Line-balancing heuristic that sequences eligible operations in descending order of their standard task duration and assigns them to stations without violating precedence or cycle time.

Line Efficiency

Ratio of total Standard Allowed Minutes produced by a sewing line (good output multiplied by garment SAM) to total operator minutes attended on the line.

Mean Time Between Failures (MTBF)

Average operating time elapsed between consecutive mechanical or electrical breakdowns of a repairable sewing or cutting machine.

Mean Time to Repair (MTTR)

Average elapsed time required to restore a failed sewing machine to full stitch-tested operation, encompassing notification, diagnosis, wrench repair and restart verification.

Operation Breakdown (OB)

Sequential engineering list of every cutting, fusing, sewing and finishing operation required to assemble a garment, specifying machine type, attachment and SMV per step.

Overall Equipment Effectiveness (OEE)

Composite manufacturing metric calculated as the product of machine Availability, speed Performance and First-Pass Quality.

Pitch Time

Theoretical ideal time per workstation required to balance a garment line, calculated as total garment SMV divided by the number of operators on the line.

Polyvalence (Multi-Skilling)

Deliberate cross-training of sewing operators across two or more distinct machine types and critical operations to insulate line balance against absenteeism and style changeovers.

Progressive Bundle System (PBS)

Conventional garment production layout in which cut garment parts move sequentially from workstation to workstation in tied bundles of 20 to 40 pieces.

Ranked Positional Weight (RPW)

Line-balancing heuristic that prioritises operations according to the sum of their own processing time plus the processing times of all downstream dependent tasks.

Recognition of Prior Learning (RPL)

Assessment and validation mechanism operated by Cameroon's MINEFOP to award formal national credentials to workers who acquired trade skills in the informal economy.

Right First Time (RFT)

Quality discipline and performance measure tracking the proportion of units processed through a station or line with zero defects on the initial pass.

Salaire Minimum Interprofessionnel Garanti (SMIG)

Statutory cross-sector monthly minimum wage in Cameroon, set at XAF 43,969 per month from 23 February 2024 for a standard 40-hour working week.

Seeded Mentor Cohort

Small, time-bound group of imported master supervisors and chief mechanics contracted with explicit local-trainee handoff milestones rather than permanent line-boss roles.

Standard Allowed Minutes (SAM / SMV)

Engineering time standard for a garment or operation combining basic observed cycle time at standard rating with percentage allowances for fatigue, personal needs and machine delay.

Traffic Light System (TLS)

Visual inline quality-control method displaying Green, Yellow or Red status cards at each sewing machine based on the defect count found in periodic roving sample audits.

Vestibule Training Centre (Training Dojo)

Dedicated off-line training room equipped with industrial sewing machines where recruits and supervisor candidates build speed, quality and troubleshooting skills without disrupting live production.

Follow the terms back to their context.

Page references point to occurrences in chapter prose. When a term does not occur in a chapter, its glossary definition is indexed.

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