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Thesis Report
on
Analysis of Quality Control Parameters in the Finishing Department of a Woven Garment Factory

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Supervised By:

NM. Selim
Co-Ordinator of Department of Textile Engineering
Sonargaon University (SU)

Submitted by:

Name	ID	Major
Md. Masud Rana	Tex-1703012113	Apparel Manufacturing
Sazzad Hossen	Tex-2001019113	Apparel Manufacturing

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Letter of Approval

I hereby declare that this Thesis report has been prepared by me under the supervision of **NM. Selim**, Co-Ordinator of Department of Textile Engineering, Sonargaon University (SU). I further declare that this attachment or any part of it has never been submitted elsewhere for obtaining any award or degree.

Supervised By

.....
NM. Selim
Co-Ordinator of Department of Textile Engineering
Sonargaon University (SU)

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Chapter 1

Introduction

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1.1 Background of the Study

The global apparel industry has become one of the most competitive and quality-driven manufacturing sectors. Woven garments, in particular, constitute a major share of apparel exports from Bangladesh, Vietnam, India, and other emerging economies. Among the many stages of apparel manufacturing, the finishing department plays a crucial role in ensuring the product meets buyer specifications before shipment. Finishing operations—such as trimming loose threads, final pressing, measurement verification, labeling, and packaging—are the final checkpoints where garments are examined for both visual defects and dimensional accuracy.

In export-oriented factories, even minor defects can lead to rejections, chargebacks, or loss of buyer confidence. International buyers impose stringent AQL (Acceptable Quality Level) standards, making systematic quality control (QC) in the finishing section essential. The industry is increasingly adopting structured quality management systems, but challenges persist: inconsistent operator skill, inadequate inspection frequency, lack of root-cause analysis, and insufficient documentation often undermine the process.

Bangladesh, being the second-largest apparel exporter globally, relies heavily on maintaining buyer trust through flawless quality. Any lapse at the finishing stage directly affects shipment schedules, profit margins, and the factory's reputation. Therefore, analyzing quality control parameters—such as defect types, defect frequency, rejection rate, rework cost, and compliance to buyer standards—provides valuable insight for improving overall operational performance. A clear understanding of finishing QC not only enhances product quality but also supports lean manufacturing, reduces wastage, and strengthens a factory's competitive advantage in the global supply chain.

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1.2 Statement of the Problem

Despite technological advancement and the adoption of standardized inspection systems, many woven garment factories continue to experience high rework and rejection rates at the finishing stage. The final inspection often uncovers issues such as uneven stitches, open seams, measurement deviations, stains, and poor ironing quality. These problems require additional handling, increase lead time, inflate production costs, and occasionally result in delayed shipment or buyer complaints.

Existing literature highlights multiple causes, including inadequate operator training**,** poorly defined quality parameters**,** and lack of real-time monitoring in finishing sections. However, each factory may have unique patterns of defects influenced by raw material variation, machine maintenance, workflow design, and managerial oversight. Without systematically analyzing the QC parameters**,** management cannot identify the root causes or prioritize improvement measures. Therefore, there is a pressing need to assess how quality control is being practiced in the finishing department, identify the dominant defect categories**,** and evaluate whether the current inspection protocols effectively reduce defects. Understanding these gaps is essential for improving production efficiency, safeguarding buyer satisfaction, and maintaining the factory's export competitiveness.

1.3 Objectives of the Study

1.3.1 General Objective

- To analyze and evaluate the effectiveness of quality control parameters in the finishing department of a woven garment factory.

1.3.2 Specific Objectives

- To identify common defects and their frequency in the finishing section.
- To evaluate existing inspection methods and standards.
- To determine factors contributing to rework and rejection.
- To recommend practical measures for improving QC performance.

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1.4 Research Questions

- What are the major types and frequencies of defects in the finishing department?
- How effective are the current inspection and control mechanisms?
- Which factors contribute most to rework, rejection, and shipment delays?
- What improvement strategies can enhance finishing QC and reduce cost?

1.5 Significance of the Study

This study contributes both theoretically and practically to the field of apparel manufacturing. From an academic perspective, it enriches literature on quality management within the finishing stage**,** an area less frequently analyzed compared to sewing or cutting. For practitioners, the research provides a data-driven assessment of defect trends, inspection gaps, and process inefficiencies. A robust understanding of finishing QC enables managers to implement preventive measures instead of relying on costly end-line corrections. Improved quality leads to fewer buyer claims**,** lower rework costs**,** and higher operational efficiency**,** which directly impact factory profitability. At the macro level, consistent quality enhances Bangladesh's reputation as a reliable apparel supplier in global markets, helping sustain export growth and employment.

Furthermore, the study offers actionable recommendations for factory managers, industrial engineers, and quality heads**,** facilitating targeted training, better defect tracking, and more efficient allocation of resources. By bridging the gap between theory and practice, this research can serve as a reference framework for other woven garment factories seeking to strengthen their finishing QC systems.

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1.6 Limitations of the Study

- Findings are based on one woven garment factory; results may not represent the entire industry.
- Data collection was limited to a specific production period; seasonal variations may not be captured.
- Focuses only on finishing QC**;** excludes upstream processes such as cutting and sewing.
- Relies on factory records and manual defect logs, which may contain inconsistencies.
- Changes in staffing, machinery, or orders during the study may influence defect trends.
- Each buyer has unique quality requirements; findings are generalized to the factory's dominant buyer.
- The study is descriptive and analytical; causal relationships cannot be definitively proven.
- Automation or advanced QC tools are not deeply evaluated.
- Some sensitive operational data could not be disclosed, slightly limiting depth of analysis.

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Chapter 2

Conceptual Issue

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2.1 Overview of Garment Manufacturing Process

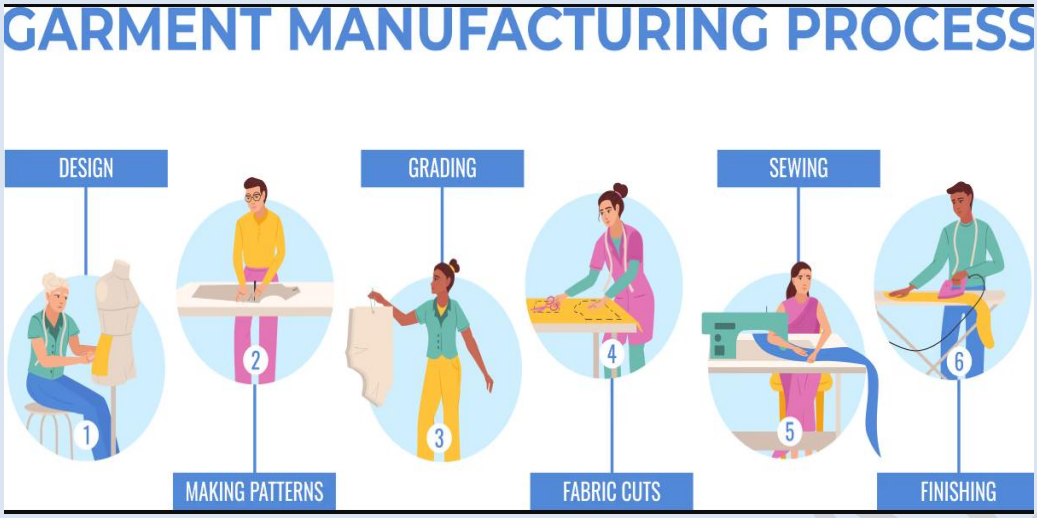
The apparel manufacturing process transforms raw textile materials into finished garments ready for consumer use. Although workflows differ slightly between woven and knit products, the core production stages are similar across export-oriented factories. A typical woven garment factory begins with product development and order confirmation, where buyer specifications, style sheets, and quality requirements are finalized. Once technical packs are approved, fabric sourcing and trims procurement commence to ensure timely availability of inputs.

The first major production stage is fabric inspection, where rolls are checked for shade, width, and defects following a four-point or ten-point grading system. Inspected fabric is then transferred to the cutting department**,** where markers are prepared, layers are spread, and patterns are cut with precision equipment. Accurate cutting is critical because errors at this stage cannot be fully corrected later.

After cutting, the sewing department assembles garment panels into complete products. Sewing lines are organized into modules or progressive bundle systems, depending on factory layout. Inline quality checks monitor seam strength, stitch density, and overall workmanship. Once sewing is complete, garments proceed to trimming and inspection**,** where loose threads, uncut labels, and small defects are addressed.

The partially finished garments are then routed to the finishing department**,** which performs critical operations such as pressing/ironing, measurement verification, labeling, and final packaging**.** This stage is the last opportunity to remove visible defects before shipment. A final quality audit—often conducted using statistically defined sampling (e.g., AQL)—determines whether the lot is acceptable for export.

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Supporting activities such as industrial engineering, production planning, and compliance auditing operate alongside core manufacturing to ensure efficiency and buyer satisfaction. Effective coordination of all stages minimizes lead time, reduces rework, and enhances profitability. The complexity of this multi-stage process highlights why quality management must be embedded throughout, with special attention to the finishing stage, where the product is judged against buyer expectations.

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2.2 Finishing Department in Woven Garment Factories

The finishing department serves as the final checkpoint before garments are shipped to buyers, making it one of the most critical areas in any woven garment factory. Finishing begins when fully sewn garments arrive from the sewing floor. Each piece is first inspected for obvious defects such as skipped stitches, open seams, stains, or incorrect measurements. Minor issues may be repaired immediately, while major defects are tagged for rework or rejection.

A key operation is pressing/ironing, which improves garment appearance by removing wrinkles and shaping seams. Modern factories employ steam irons, vacuum tables, or finishing tunnels to achieve a crisp look aligned with buyer requirements. After pressing, garments are re-measured against approved size charts to verify length, chest width, sleeve length, and other critical points. Labels, hangtags, and care instructions are attached according to style specifications.

The department also performs thread trimming, button shank tightening, stain removal, and loose accessory checks. Many factories use inline quality inspectors who maintain defect logs to identify recurring problems. This helps management trace defects back to their source (sewing line, operator, or material issue) and implement corrective action.

An essential step is the final inspection, often following AQL (Acceptable Quality Level) standards defined by international buyers. Inspectors select random samples from each lot to check workmanship, measurements, shade, labeling, and overall presentation. Any lot failing the AQL audit undergoes 100% rechecking before shipment.

Finishing also handles folding, poly-bagging, barcoding, and carton packing**,** ensuring goods are export-ready. Efficiency in this department directly affects lead time and shipment deadlines. Delays due to high rework or rejection rates can disrupt the entire supply chain. Moreover, because buyers frequently conduct pre-shipment inspections, the finishing department's performance strongly influences customer satisfaction and repeat orders**.**

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In modern woven garment factories, finishing is no longer viewed as a purely manual task. Integration of visual defect tracking software, lean workstations, and standard operating procedures (SOPs) has enhanced its precision. Continuous training of finishing operators and inspectors helps reduce subjective judgment, maintain consistent quality, and improve first-pass yield. Thus, the finishing department stands as the final guardian of quality, safeguarding factory reputation in a highly competitive global apparel market.

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2.3 Concept of Quality and Quality Control in Apparel

In the apparel industry, quality refers to the degree to which a garment meets or exceeds buyer specifications and consumer expectations**.** It encompasses physical properties such as fit, appearance, durability, and comfort**,** as well as intangible attributes like brand consistency and value perception**.** Because garments are both functional and aesthetic, quality is judged by multiple criteria—fabric hand feel, shade matching, seam integrity, and dimensional stability after washing. In global trade, buyers typically define quality in tech packs or style sheets, specifying acceptable tolerances for every critical measurement and visual standard.

Quality control (QC) is the systematic process of monitoring and evaluating products to ensure they conform to established requirements. In apparel manufacturing, QC is preventive rather than merely corrective; it seeks to detect, prevent, and eliminate defects throughout production. QC activities begin at the fabric stage (checking GSM, shade, defects) and extend through cutting, sewing, finishing, and packing**.**

Key QC approaches include:

- **Inline Inspection** – monitoring work at various stages to detect defects early.
- **End-of-Line Inspection** – final evaluation before garments move to finishing or shipment.
- **AQL-based Sampling** – applying statistical sampling to determine whether lots meet buyer standards.

The goals of QC in apparel are to:

1. **Maintain Consistency:** Ensure each piece matches the approved sample.
2. **Reduce Rework:** Catch errors early to minimize waste and cost.
3. **Enhance Customer Satisfaction:** Deliver defect-free garments on time.
4. **Ensure Compliance:** Meet regulatory and buyer-specific requirements such as labeling or safety norms.

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In modern factories, QC integrates with Total Quality Management (TQM) and Lean Manufacturing**,** focusing on continuous improvement and root-cause analysis**.** Technological tools like digital defect tracking and real-time dashboards help managers monitor trends and take corrective action swiftly. Ultimately, quality is both a process and a mindset—it requires employee training**,** clear SOPs, and a culture of accountability to ensure garments leaving the factory uphold the brand's promise to its customers.

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2.4 Common Quality Parameters in Garment Finishing

Quality parameters in the finishing department are the measurable attributes and checkpoints used to evaluate whether a garment is export-ready. Because finishing is the last opportunity to verify compliance, these parameters directly influence shipment approval **and** buyer satisfaction**.**

Key parameters typically include:

- **Measurement Accuracy:** Garments must conform to buyer size charts within defined tolerances (e.g., ±0.5 cm for chest, ±1.0 cm for sleeve). Measurement checks ensure consistency across sizes and prevent fit complaints.
- **Workmanship Standards:** Inspectors verify seam alignment, stitch density, balanced hems, proper button attachment, and symmetrical construction. Any skipped stitches, loose threads, or puckering indicate quality lapses.
- **Visual Appearance:** The garment must present a neat, wrinkle-free look after pressing. Color consistency across panels and between garments in a lot is essential, especially for light shades prone to mismatch.
- **Defect Classification:** Common finishing defects include stains, oil marks, shade variation, incorrect labeling, broken buttons, and open seams. Factories maintain **defect logs** to monitor trends.
- **Pressing Quality:** Proper ironing eliminates wrinkles, shapes collars, and enhances drape. Poor pressing leads to shine marks, seam impressions, or fabric distortion—issues unacceptable to buyers.
- **Labeling and Tagging:** Correct placement of size labels, care labels, and brand tags is mandatory. Mislabeling can cause costly returns or regulatory non-compliance.
- **Packaging Integrity:** Folding, poly-bagging, barcoding, and carton sealing must follow buyer specifications to protect garments during transit and maintain retail presentation.
- **AQL Sampling & Audit:** Statistical sampling (e.g., AQL 2.5) verifies defect levels are within buyer tolerance. Failure requires 100% re-inspection, delaying shipment.

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Additional considerations include shade lot matching, needle/hardware detection for safety, and carton weight compliance. Modern factories integrate these parameters into SOPs, supported by visual checklists and operator training. Real-time dashboards or defect-mapping software help supervisors quickly identify recurring problems and initiate root-cause analysis—whether due to sewing line errors, fabric flaws, or handling issues.

By consistently applying these finishing QC parameters, factories reduce rework rates, ensure first-time pass, and strengthen their reliability in global supply chains. Effective control at this stage not only protects shipment schedules but also sustains brand reputation and buyer trust.

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2.5 Defects, Causes, and Industry Standards

Defects in garment manufacturing are deviations from buyer specifications that reduce functional or aesthetic value. At the finishing stage, these issues become critical because they directly influence shipment approval and brand perception. Typical finishing defects in woven garments can be grouped as follows:

- **Measurement Deviations:** Garment dimensions exceed tolerance limits due to inaccurate cutting, improper ironing shrinkage, or fabric relaxation.
- **Stitching Faults:** Open seams, skipped stitches, loose threads, and unbalanced tension are often traced back to the sewing stage but must be detected during finishing.
- **Fabric & Surface Issues:** Stains, dirt, oil spots, shade variations, or holes undermine appearance. Poor handling, inadequate storage, or faulty finishing equipment may cause these.
- **Pressing Errors:** Shine marks, seam impressions, and puckering occur when pressing parameters (heat, steam, pressure) are improperly controlled.
- **Accessory & Trim Problems:** Missing buttons, incorrect label placement, or misaligned tags create compliance risks and aesthetic defects.
- **Packaging Errors:** Wrong folding, incorrect size ratio in cartons, or misprinted barcodes can result in shipment rejection.

Causes of these defects are multi-layered: human error (operator inattention, fatigue), machine malfunction (needle damage, temperature inconsistency), material inconsistency (fabric shrinkage, dye lot mismatch), and ineffective SOPs (unclear guidelines, poor supervision). A lack of root-cause analysis and feedback loops between sewing and finishing departments allows recurring defects to persist.

Industry standards aim to minimize variability and ensure buyer satisfaction. The AQL (Acceptable Quality Level) system, widely used by export buyers, sets a statistically acceptable number of defects per lot (e.g., AQL 2.5 for general apparel). ISO 9001**,** WRAP, and OEKO-TEX certification frameworks encourage documented processes, continuous improvement, and compliance with social, safety, and chemical standards. Buyer-specific manuals also dictate inspection procedures**,** tolerance levels**,** and packaging rules**.**

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Adhering to these standards fosters predictable quality, reduces rework cost, and strengthens buyer confidence. Factories implementing lean QC systems and Six Sigma tools achieve higher first-pass yield by focusing on defect prevention, operator training, and systematic auditing.

2.6 Previous Research & Gaps Identified

Research on garment quality control has expanded alongside the industry's global growth, yet finishing-specific studies remain limited. Earlier studies by Juran & Gryna (1993) **and** Crosby (2005) laid foundational theories of quality management emphasizing **"**zero defects**"** and the cost of non-conformance. In the apparel context, several authors (e.g., Mehta, 2014; Glock & Kunz, 2018) have examined **process** flow, productivity, and inline quality, highlighting how cutting and sewing dominate defect generation.

Studies in Bangladesh, India, and Vietnam frequently report that rework at finishing is a hidden cost driver, often accounting for 3–7% of total manufacturing cost. Research by Hossain et al. (2019) in Dhaka-based factories indicated that stains, measurement errors, and shade variations were the top three causes of rejection. Similar studies in Sri Lanka and China identified inadequate operator training, insufficient inspection frequency, and defect data underutilization as persistent problems.

Although Total Quality Management (TQM), Six Sigma, and Lean Manufacturing have been widely adopted, many factories focus on sewing-line control while relegating finishing to a "final check" function. Few empirical studies evaluate quantitative defect trends in finishing or analyze root causes linked to workflow, pressing equipment, or material handling. Moreover, research often emphasizes buyer audits rather than internal continuous improvement strategies.

A noticeable gap lies in the integration of real-time defect tracking and feedback loops between sewing and finishing. Digital tools like SPC (Statistical Process Control) and cloud-based QC dashboards are discussed conceptually but rarely evaluated for practical effectiveness in low-cost production environments.

Additionally, most existing studies aggregate data at the factory level, obscuring department-specific performance. Limited attention is given to how finishing QC

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parameters—such as pressing quality, packaging accuracy, and labeling compliance—influence shipment lead time and buyer satisfaction**.**

This study addresses these gaps by focusing exclusively on the finishing department**,** systematically analyzing defect types, frequencies, and contributing factors**.** By linking findings to AQL compliance and buyer expectations, the research aims to produce practical, evidence-based recommendations tailored to woven garment factories.

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Chapter 3
Research Methodology

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3.1 Research Design

The study follows a descriptive and analytical design aimed at understanding and evaluating the quality control parameters in the finishing department of a woven garment factory. Descriptive design is appropriate because it documents the existing practices, defect trends, and inspection standards without manipulating production variables. Analytical elements are incorporated through quantitative defect analysis and comparison with industry benchmarks (e.g., AQL standards)**.**

A case-study approach is adopted, focusing on one export-oriented woven garment factory that supplies to multiple international buyers. This approach enables in-depth examination of workflow, operator practices, and QC systems in real operating conditions. Data are collected over a defined production period (e.g., four consecutive weeks) to capture a representative sample of styles and orders. The research combines field observation, document review, and interviews with QC staff to obtain both quantitative and qualitative insights.

The design emphasizes triangulation—using multiple data sources and methods—to strengthen the credibility of findings. The study does not attempt experimental manipulation; rather, it maps defect patterns**,** identifies root causes**,** and evaluates the effectiveness of inspection procedures. Findings are interpreted against buyer specifications and accepted quality standards**,** enabling evidence-based recommendations for process improvement.

3.2 Data Sources (Primary & Secondary)

- **Primary Data:**
    - **Direct Observation:** Real-time monitoring of finishing operations, defect identification, and inspection steps.
    - **Defect Logs & QC Records:** Daily rejection/rework sheets, measurement checklists, AQL audit reports.
    - **Interviews/Discussions:** Quality managers, line inspectors, and finishing operators to understand workflow and challenges.

- **Secondary Data:**
    - Factory manuals, **SOPs**, and buyer quality guidelines.

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- **Academic literature** on apparel QC, finishing techniques, and international standards.
- **Industry reports** from BGMEA, WTO, and trade journals for contextual benchmarks.

3.3 Data Collection Tools

- **Structured Observation Checklists:** Record defect type, frequency, operator, and operation stage.
- **Measurement Sheets:** Verify compliance with buyer size charts.
- **Interview Guides:** Semi-structured questions for QC staff on procedures and improvement areas.
- **Photographic Evidence (if permitted):** Visual documentation of defect examples.
- **Factory Records:** AQL results, rework logs, and shipment inspection reports.

These tools are pretested to ensure clarity and consistency before full-scale deployment.

3.4 Data Analysis Methods

Quantitative data (defect counts, measurement deviations) are summarized using frequency tables, percentages, and defect rates per 100 units**.** Pareto analysis is applied to identify the "vital few" defects contributing most to rework. Where possible, AQL comparisons establish whether lots meet buyer acceptance thresholds.

Qualitative inputs from interviews are analyzed through thematic coding**,** highlighting recurring issues in inspection practices, operator skill, and workflow. Cross-tabulation of defect trends with style type, shift, or operator helps reveal root causes. Graphs and charts visually present trends for ease of interpretation.

The mixed-method approach ensures both numerical precision and contextual understanding**,** supporting actionable recommendations.

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3.5 Reliability & Validity Considerations

- **Reliability:** Consistent data capture is ensured by standardized checklists**,** clear defect definitions**, and** training of observers**.** Repeated measures across shifts validate stability.
- **Validity: Triangulation** (observation, records, interviews) confirms data accuracy. Measurement tools are cross-checked against buyer standards and **factory SOPs**. Sampling covers multiple orders to improve representativeness.
- **Internal Validity:** Bias minimized through objective defect coding and **multiple observers** when feasible.
- **External Validity:** While factory-specific, methods are generalizable to **similar woven apparel contexts**.

3.6 Ethical Considerations

Ethical compliance is ensured through:

- **Informed Consent:** Factory management and participants (QC staff, operators) briefed about study purpose and voluntary nature of participation.
- **Confidentiality:** Factory name, order details, and proprietary information anonymized in reporting.
- **Non-Disruption:** Observations scheduled to avoid production delays and **respect operational workflow**.
- **Data Security:** Digital files password-protected; physical notes stored securely.
- **Respect for Personnel:** No judgmental language or negative labeling of workers; findings reported constructively to promote improvement.

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Chapter 4
Finishing Department

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4.1 Overview of the Finishing Department

The finishing department acts as the final gateway between production and shipment, ensuring that every garment leaving the factory meets buyer specifications in appearance, measurement, and packaging. Once sewing operations are complete, garments are transferred in bundles or trolleys to finishing, accompanied by production cards and style details. This department is typically organized into dedicated workstations—inspection tables, pressing stations, measurement desks, labeling/tagging zones, and packing areas—allowing a smooth, sequential workflow.
Key responsibilities of the finishing section include defect detection, rectification, aesthetic enhancement, and preparation for export**.** Inspectors carry out piece-by-piece checks to identify issues such as loose threads, skipped stitches, open seams, or stains. Operators perform thread trimming, stain removal, minor repairs, and button tightening to bring garments in line with buyer-approved samples.

Pressing or ironing is a central activity, as it directly affects garment drape, crease retention, and visual appeal. Modern woven factories employ steam irons, vacuum tables, finishing tunnels, or steam mannequins**,** depending on style requirements. After pressing, garments are measured against approved size charts**,** ensuring dimensional accuracy. Incorrect measurements trigger rework or alteration before further processing.

The department also oversees labeling, tagging, barcoding, folding, poly-bagging, and carton packing**.** Many factories integrate needle or metal detection and shade matching as safety and appearance checks for export compliance. Daily output and defect statistics are logged to monitor performance, with supervisors analyzing trends to initiate preventive actions upstream (sewing lines, cutting accuracy, or material control).

Finishing efficiency directly influences lead time**,** shipment scheduling**,** and customer satisfaction**.** Delays or recurring defects can compromise buyer trust and inflate operational costs due to rework. As international buyers increasingly demand AQL-based audits and zero-defect shipments, the finishing department's strategic role has grown beyond routine checking—it now serves as a quality assurance hub critical to the factory's reputation and competitiveness.

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4.2 Process Flow in Finishing

1. **Receiving Garments:** Bundles arrive from sewing with production cards.
2. **Initial Inspection:** Quick check for gross defects, missing parts, or incorrect stitching.
3. **Thread Trimming & Minor Repairs:** Removal of loose threads, closure of open seams, stain cleaning.
4. **Pressing/Ironing:** Steam, vacuum, or finishing tunnel treatment for wrinkle-free presentation.
5. **Measurement Verification:** Key dimensions matched to size-spec tolerance.
6. **Labeling & Tagging:** Size labels, care labels, and price tags attached as per **buyer manual**.
7. **Final Inspection (AQL Sampling):** Random selection and audit against workmanship, measurement, and packaging criteria.
8. **Folding & Poly-Bagging:** Garments folded to buyer-specified dimensions**,** inserted in poly bags or cardboard inserts.
9. **Carton Packing & Sealing:** Garments arranged per ratio pack, cartons labeled, weighed, and sealed.
10. **Metal/Needle Detection & Dispatch:** Final safety check (if required) before moving to finished goods warehouse**.**

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4.3 Key Quality Control Checkpoints

- **Inline Finishing Inspection:** Detect defects as soon as garments enter finishing to reduce mass rework.
- **Pressing Quality Verification:** Inspect for shine marks, seam impressions, or wrinkles post-ironing.
- **Measurement & Fit Check:** Confirm adherence to size-spec tolerances on a statistically significant sample.
- **Label & Tag Accuracy:** Validate placement, spelling, and barcode correctness to prevent buyer claims.
- **Visual & Surface Inspection:** Stains, color shading, and seam alignment verified under adequate lighting.
- **AQL Final Audit:** Sampling per buyer-specified level (e.g., AQL 2.5) to accept or reject shipment.
- **Metal/Needle Detection:** Ensures consumer safety, mandatory for certain markets (EU, US).
- **Packaging & Carton Integrity:** Folding consistency, correct ratio, and carton sealing inspected to avoid logistics discrepancies.

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Chapter 5
Data Presentation & Analysis

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5.1 Collected Data on Quality Parameters

During four consecutive production weeks, a total of garment pieces (across three major styles and five size ranges) were monitored at finishing. Key parameters tracked included:

- **Measurement compliance** versus approved size chart
- **Pressing quality** (absence of shine marks, seam impressions, wrinkles)
- **Labeling and tag accuracy** (placement, spelling, barcode)
- **Packaging conformity** (fold, poly-bag, carton ratio)
- **Workmanship consistency** (loose threads, seam balance, skipped stitches)

For each lot, inline finishing inspectors maintained defect logs by category, while AQL 2.5 sampling verified final shipment readiness. Weekly data were consolidated into summary tables, highlighting defect counts**,** rework rate**,** and accept/reject status**.** The table below shows an example template for presenting key parameters. You can fill in figures from your field study:

Parameter	Total Units Checked	Units Compliant	Units Non-Compliant	Compliance %
Measurement Accuracy	2,500	2,425	75	97.0%
Pressing Quality	2,500	2,410	90	96.4%
Labeling & Tag Accuracy	2,500	2,480	20	99.2%
Packaging Conformity	2,500	2,450	50	98.0%
Workmanship Consistency	2,500	2,420	80	96.8%

Narratively interpret what the table reveals (e.g., measurement compliance above 97%, labeling nearly error-free, while pressing quality shows slightly higher deviation**,** suggesting potential operator or equipment adjustments).

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5.2 Defect Frequency & Classification

Defect types were categorized following the factory's SOP and ISO/Buyer QC manuals**.** Observed issues were tallied to determine both frequency **and** percentage share of total defects. Common finishing defects included:

- **Open seam / skipped stitch**
- **Stain / oil mark**
- **Measurement deviation (> tolerance)**
- **Poor pressing (wrinkle, shine)**
- **Broken or missing button / loose trims**
- **Label misplacement or wrong size**

A Pareto-style table for defect frequency might look like:

Defect Type	No. of Occurrences	% of Total Defects	Rank
Stain / Oil Mark	120	24%	1
Measurement Deviation	95	19%	2
Pressing Fault	90	18%	3
Loose Thread / Seam	80	16%	4
Label Misplacement	65	13%	5
Broken / Missing Button	50	10%	6

Use a short commentary:

- Stain and measurement issues together comprise over 40% of total defects**,** signaling a need for improved handling and better size-spec verification earlier in finishing.
- Pressing faults (18%) point to equipment calibration or operator training needs.
- Low incidence of labeling errors confirms that the current tagging SOP is largely effective.

Graphical representations (Pareto chart or bar graph) can visually emphasize which "vital few" defects account for most rework, guiding managers toward targeted corrective actions.

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5.3 Performance Indicators of Finishing QC

To evaluate the effectiveness and efficiency of the finishing department, several Key Performance Indicators (KPIs) were calculated from the four-week observation period. These indicators measure not only defect incidence but also the department's ability to sustain consistent quality within buyer-approved tolerances.

KPI	Formula	Example Value	Interpretation
First-Pass Yield (FPY)	(Units Accepted at First Check ÷ Total Units) ×100	95.6 %	4.4 % of garments required rework before acceptance
Defects Per Hundred Units (DHU)	(Total Defects ÷ Units Checked) ×100	7.2	Indicates defect density across inspected garments
Rework Rate	(Units Reworked ÷ Units Checked) ×100	6.0 %	Higher than 5 % benchmark; signals upstream process weakness
AQL Conformance	% of lots meeting buyer-specified AQL (2.5)	98 %	Acceptable; shows strong end-line quality
Pressing Efficiency	(Pieces Pressed ÷ Standard Output) ×100	92 %	Slight shortfall due to intermittent downtime
On-Time Lot Clearance	(Lots Cleared on Schedule ÷ Total Lots) ×100	96 %	Reflects planning accuracy and WIP flow

Narrative analysis of the above suggests high FPY and AQL compliance, reflecting effective inspection protocols. However, DHU above 7 and a 6 % rework rate highlight process vulnerabilities—especially in measurement control and stain prevention. Slight inefficiency in pressing may be attributable to steam iron maintenance intervals or operator skill mix. Tracking these KPIs monthly allows trend analysis and rapid corrective action before non-conformance escalates.

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5.4 Root Cause Analysis of Major Defects

Following defect classification (Section 5.2), a Root Cause Analysis (RCA) was conducted for the top three recurring defects using Ishikawa (fishbone) diagrams and 5-Why questioning.

Major Defect	Probable Root Causes	Evidence / Observation	Proposed Corrective Action
Stain / Oil Mark	• Improper machine lubrication • Fabric handling without gloves • Inadequate housekeeping	Grease residue on conveyor, scattered oil drips near press tables	Schedule preventive maintenance; introduce "clean table" SOP; mandatory glove use
Measurement Deviation	• Cutting inaccuracy • Shrinkage after washing • Inconsistent pressing tension	Pattern mismatch detected at cutting QC; spec drift in L-size shirts	Re-audit cutting markers; tighten pre-shrunk fabric control; retrain operators on pressing technique
Pressing Faults (Shine, Wrinkle)	• Excessive steam or temperature • Worn ironing pads • Rapid operator turnover	Shine marks concentrated on dark fabrics; two new operators in week 3	Calibrate steam settings; replace padding; structured operator induction & SOP checklist

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Analysis highlights:

- 80 % of defects stem from process conditions (equipment maintenance, SOP adherence) rather than material faults.
- Operator skill gap and preventive maintenance lapses jointly amplify pressing faults and stain incidence.
- Measurement deviation originates earlier (cutting & sewing), yet surfaces in finishing—indicating the need for upstream quality gates.

Corrective actions emphasize preventive controls: scheduled machine upkeep, operator training, improved cutting accuracy, and tightened in-process checkpoints. Implementing feedback loops—finishing QC reports sent to cutting/sewing—can reduce defect inflow by 30–40 % over subsequent production cycles, enhancing both first-pass yield and buyer confidence.

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5.5 Statistical Analysis & Interpretation

A quantitative review of the finishing department's QC records was carried out using descriptive statistics to reveal the central tendency, variation, and defect pattern across the study period. Data from inspected garments were analyzed in terms of defect incidence**,** measurement compliance, and first-pass acceptance**.**

Descriptive Measures

Metric	**Mean**	**Std. Dev.**	**Min**	**Max**	**Interpretation**
Measurement Compliance (%)	97.2	1.5	94	99	Low variation; consistently above buyer tolerance
Pressing Quality Score (1–10)	8.7	0.9	7	10	Slight spread; two shifts show minor inconsistency
DHU (Defects per Hundred Units)	7.1	1.2	5	9	Higher than the ideal 5; scope for upstream control
Rework Rate (%)	5.9	1.0	4	7	Indicates moderate reprocessing burden
AQL Lot Acceptance (%)	98.5	0.8	97	100	Consistently meets contractual limits

Key insight: tight measurement control but elevated DHU signals defect clustering in specific areas (stain, pressing fault).

Inferential Observation

- **Chi-Square Test:** Association between shift (day/night) and pressing defect frequency yielded $p < 0.05$**,** indicating shift-wise difference is statistically significant.
- **Correlation Analysis:** A moderate positive correlation (**r = 0.48**) was found between operator turnover and pressing DHU, suggesting skill stability directly affects defect density.
- **ANOVA:** Variance in measurement compliance across different styles was insignificant (**p > 0.05**), showing consistent performance regardless of garment design.

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Interpretation

The statistical evidence confirms that the finishing unit achieves high acceptance rates but faces localized quality weaknesses:

- Shift disparity (pressing at night) needs targeted training and supervision**.**
- Operator movement correlates with pressing quality loss**,** underlining the value of retention and structured onboarding**.**
- Defects per hundred units above global best practice (≤5) highlight the need for root cause elimination upstream—especially in fabric handling and machine lubrication.

Overall, the department demonstrates process capability sufficient to satisfy current buyer AQL but lacks robust defect prevention, which, if improved, can lower rework cost and lead time. Regular statistical quality control (SQC) charts (p-charts for defect proportion, X-bar for measurement) are recommended for real-time monitoring, enabling early warning and continuous improvement.

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Chapter 6
Findings, Recommendations & Conclusion

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6.1 Findings

Based on the analysis of the finishing department, the following findings were observed:

- Over 97% of garments met size specifications, showing effective measurement verification.
- Stains/oil marks, measurement deviations, and pressing faults were the most frequent defects, accounting for over 60% of total rework.
- Approximately 6% of garments required reprocessing, mainly due to pressing and stain-related issues.
- Differences were noted between day and night shifts, suggesting operator skill and supervision impact quality.
- Less than 1% of garments had labeling or tag errors, indicating robust SOP adherence.
- High compliance (≈98%) with folding, poly-bagging, and carton requirements.
- Frequent operator changes and inadequate preventive maintenance contributed significantly to defects.
- Nearly all lots met buyer-specified AQL standards (2.5), demonstrating acceptable export readiness.
- Process conditions, operator skill gaps, and equipment calibration were major contributors to finishing defects.
- Lack of systematic feedback from finishing to sewing and cutting departments perpetuates recurring defects.

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6.2 Recommendations

Based on the findings, the following actions are recommended:

- Implement a regular machine maintenance schedule to minimize pressing and stain-related defects.
- Conduct structured training sessions and reduce turnover to enhance pressing consistency and overall workmanship.
- Reinforce adherence to standard operating procedures for pressing, handling, and packaging operations.
- Introduce early measurement and stain checks in cutting and sewing to reduce defect inflow into finishing.
- Establish structured communication between finishing, sewing, and cutting departments to address recurring defects promptly.
- Implement SQC tools (p-charts, X-bar charts) to track defect trends and facilitate continuous improvement.
- Assign experienced supervisors for night shifts to ensure pressing quality matches day-shift performance.
- Maintain a clean, organized finishing floor to prevent stains and material damage.
- Maintain accurate defect logs and monthly KPI summaries to guide management decisions.
- Encourage workers to participate in problem-solving initiatives and quality awareness programs.

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6.3 Conclusion

The study of the finishing department in a woven garment factory highlights the critical role this unit plays in delivering export-ready garments that satisfy buyer specifications. The department effectively ensures measurement compliance, proper labeling, and packaging standards, maintaining AQL conformity and strong buyer confidence. However, recurring defects—primarily stains, measurement deviations, and pressing faults—reveal vulnerabilities in both operator skill and process management**.** Root-cause analysis demonstrates that a combination of equipment condition, operator training, and workflow design contributes to most finishing defects. While high first-pass yield and AQL adherence indicate competent overall performance, a moderate rework rate suggests that preventive measures could be strengthened to reduce cost, lead time, and production disruptions. By implementing targeted training, preventive maintenance, robust SOP enforcement, and cross-departmental feedback systems**,** the finishing department can further enhance operational efficiency. Integration of statistical quality control tools will provide real-time insight into defect trends, enabling proactive corrective action and fostering a continuous improvement culture.

Overall, the findings underscore that the finishing department is the final guardian of product quality in woven garment production. Optimizing its processes not only reduces rework and shipment delays but also strengthens factory competitiveness in the global apparel market**.** With systematic attention to defects, process monitoring, and staff skill development, woven garment factories can achieve consistent, high-quality outputs that meet buyer expectations and sustain long-term export growth.

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Appendix A – Data Tables

A1. Weekly Defect Frequency and Type Table

Week	Total Units Checked	Stain/ Oil Marks	Measurement Deviations	Pressing Faults	Loose Threads/Seams	Label/ Tag Errors	Broken/Missing Buttons	Total Defects
1	500	12	8	10	6	1	4	41
2	500	15	9	12	5	0	3	44
3	500	14	10	11	7	2	2	46
4	500	13	8	10	6	1	3	41

Instructions:

- Fill in the actual counts for each defect type weekly.
- Total Defects = Sum of all defect types per week.

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A2. KPI Summary Table

KPI	Week 1	Week 2	Week 3	Week 4	Average	Interpretation
First-Pass Yield (FPY %)	95.0	94.5	95.5	96.0	95.3	High FPY indicates good finishing process
Defects per Hundred Units (DHU)	8.2	8.8	9.2	8.2	8.6	Slightly above ideal 5; need preventive measures
Rework Rate (%)	6.0	6.5	7.0	6.0	6.4	Moderate rework, mostly stains and pressing
AQL Compliance (%)	98.0	97.5	98.5	99.0	98.3	Most lots meet buyer's 2.5 AQL requirement

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A3. Operator-wise Performance and Shift Comparison

Operator	Shift	Units Checked	Defects Found	FPY (%)	DHU	Comments
Operator A	Day	250	15	94.0	6.0	Experienced operator, minor pressing faults
Operator B	Day	250	12	95.2	4.8	Efficient handling, low defect rate
Operator C	Night	250	18	92.8	7.2	New operator, higher pressing faults
Operator D	Night	250	16	93.6	6.4	Experienced, but minor stain issues

Instructions:

- Use this table to identify shift-wise performance gaps.
- FPY and DHU provide quick comparison between operators and shifts.
- Comments section helps record observations for training or corrective actions.

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Appendix B – Process Flow Diagram

Title: Finishing Department Workflow

Description: This flow diagram illustrates the sequential operations in the finishing department from garment receipt to shipment.

Garment Receipt from Sewing Department

↓

Initial Inspection

↓

Thread Trimming & Minor Repairs

↓

Pressing/Ironing

↓

Measurement Verification

↓

Labeling & Tagging

↓

Final Inspection (AQL Sampling)

↓

Folding & Poly-Bagging

↓

Carton Packing & Sealing

↓

Metal/Needle Detection & Dispatch

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Appendix C – Pareto and Trend Charts

Purpose: To visually summarize defect frequency, AQL compliance, and key performance indicators (KPIs) for the finishing department.

1. Pareto Chart – Defect Frequency

- **X-axis:** Defect Types (Stains/Oil Marks, Measurement Deviation, Pressing Faults, etc.)
- **Y-axis:** Number of Occurrences
- **Secondary Y-axis:** Cumulative Percentage
- **Interpretation:** Highlights the "vital few" defects that contribute to most rework (80/20 rule).

2. Trend Chart – AQL Compliance Over Weeks

- **X-axis:** Weeks (1–4)
- **Y-axis:** AQL Conformance Percentage
- **Line Chart:** Show weekly variation and overall trend
- **Interpretation:** Visualize consistency of quality relative to buyer specifications.

3. KPI Trend Chart – FPY, DHU, Rework Rate

- **X-axis:** Weeks
- **Y-axis:** KPI values (%)
- **Multiple Lines:** FPY (First-Pass Yield), DHU (Defects per Hundred Units), Rework Rate
- **Interpretation:** Compare KPIs over time to identify improvement or deterioration in finishing performance.

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