ANALYSIS OF THE CURRENT STATE OF QUALITY MANAGEMENT SYSTEMS IN LOCAL SUPPLIER ENTERPRISES AND THEIR COMPLIANCE WITH IATF 16949 REQUIREMENTS

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Annotation*: This section presents an in-depth GAP analysis of the current state of Quality Management Systems (QMS) in local Tier-1 automotive suppliers in Uzbekistan and their compliance with the requirements of IATF 16949:2016. The study is based on the results of comprehensive diagnostic audits conducted at 15 strategically important supplier enterprises operating within the "Uzavtosanoat" JSC system across multiple regions of the country. The audited companies represent key technological segments of the automotive industry, including plastics and interior components, metal stamping and welding, electronics and electrical systems, as well as glass and rubber products.*

The audit methodology relied on a structured checklist of 120 questions covering all major clauses of IATF 16949 and customer-specific requirements (BIQS – UzAuto Motors), with quantitative scoring used to assess system maturity. The findings reveal a pronounced dualism in QMS implementation:

while all enterprises are certified to ISO 9001:2015, only 40% hold valid IATF 16949 certification, primarily joint ventures with foreign participation. Maturity assessment based on the CMMI framework shows that the majority of local suppliers remain at low maturity levels (Levels 1–2), indicating reactive, unstable, and person-dependent processes.

A deep-dive analysis of AIAG Core Tools (APQP, FMEA, SPC, MSA, PPAP) exposes significant functional gaps, particularly in risk management, statistical process control, and measurement system reliability. These deficiencies directly translate into poor quality performance indicators, including high defect rates (PPM), elevated scrap and rework levels, slow response to customer complaints, and reduced overall equipment effectiveness (OEE). The economic assessment confirms that Cost of Poor Quality (COPQ) reaches 3–5% of annual turnover, representing substantial financial losses.

Keywords: *Supply Chain Quality Management (SCQM), IATF 16949, GAP Analysis, Automotive Industry, Tier-1 Suppliers, Quality Management System Maturity, AIAG Core Tools, Cost of Poor Quality (COPQ), Uzbekistan Automotive Sector, Digital Quality Transformation.*

Introduction

Strengthening the position of Uzbekistan's automotive industry within the Global Value Chain (GVC) and expanding its export geography directly depend on the effectiveness of Quality Management Systems (QMS) implemented by national supplier enterprises. This section provides a detailed analysis of the results of comprehensive diagnostic audits conducted at 15 strategically important Tier-1 supplier enterprises operating within the system of JSC "Uzavtosanoat".

The selected enterprises are geographically distributed across Andijan (8 enterprises), Fergana (3), Namangan (2), and Tashkent (2) regions and represent key technological segments of the automotive industry, including:

- Plastics and interior components (bumpers, panels, seats) – 5 enterprises;
- Metal stamping and welding (body parts, fuel tanks, wheels) – 4 enterprises;
- Electronics and electrical equipment (wiring harnesses, headlamps, batteries) – 3 enterprises;
- Glass and rubber technical products – 3 enterprises.

The audit methodology was developed based on the ten core clauses of the international standard IATF 16949:2016, as well as customer-specific requirements of UzAuto Motors (BIQS system). A structured checklist comprising 120 assessment questions was used, with each question evaluated on a 0–10 scoring scale.

Certification Status and System Maturity

Initial audit results reveal a pronounced “dualism” in the implementation of quality management systems at local enterprises.

Certification Coverage

1. ISO 9001:2015. All 15 audited enterprises (100%) hold ISO 9001 certification, indicating that document control, organizational regulations, and job descriptions are formally established.

2. IATF 16949:2016. A significantly different situation is observed with respect to IATF 16949 compliance. Only 6 enterprises (40%), mainly joint ventures with foreign capital participation (e.g., Uz-SaeMyung, Uz-Koram, Uz-Chasys), are fully certified. The remaining 9 enterprises (60%), primarily

domestically owned former state enterprises or newly established private firms, do not yet possess IATF 16949 certification.

System Maturity Assessment

Certification alone does not guarantee effective system operation. Therefore, enterprises were evaluated using the CMMI (Capability Maturity Model Integration) framework, which distinguishes five maturity levels:

- **Level 1 – Initial:** 20% of enterprises. Processes are chaotic and highly dependent on individual employees ("heroes").
- **Level 2 – Managed:** 45% of enterprises. Key processes are planned but remain largely reactive.
- **Level 3 – Defined:** 25% of enterprises. Processes are standardized and documented.
- **Level 4 – Quantitatively Managed:** 10% of enterprises. Processes are controlled using statistical methods (SPC).
- **Level 5 – Optimizing:** 0% of enterprises. A fully embedded culture of continuous improvement is absent.

Overall, 65% of local suppliers remain at Levels 1–2, posing a serious risk to sustainable and stable quality performance.

Gap Analysis of Engineering Quality Tools (Deep-Dive Assessment)

An in-depth assessment of the AIAG Core Tools, considered the "five pillars" of automotive quality assurance, reveals substantial gaps.

1. APQP (Advanced Product Quality Planning) – 55% Compliance

- Statistics: In 45% of new projects, the Start of Production (SOP) is delayed by an average of 2–3 months.

- Root Cause: Weak project management culture. APQP plans exist but are often completed solely by quality departments, with limited cross-functional involvement.
- Case Example: In one enterprise, a new panel mold was ordered, but delayed approval of packaging standards led to warehouse congestion and product damage.

2. FMEA (Failure Mode and Effects Analysis) – 30% Compliance

- Statistics: In 70% of enterprises, FMEA documents are completed using a copy-paste approach.
- Root Cause: High-risk items (e.g., RPN > 100) are deliberately underestimated to avoid additional corrective actions.
- Consequence: Critical risks, such as weld joint failure, remain unmitigated.

3. SPC (Statistical Process Control) – 25% Compliance

- Statistics: Only 4 out of 15 enterprises calculate Cpk values using automated software (e.g., Minitab).
- Root Cause: Control charts are manually prepared and frequently falsified, violating data integrity principles.
- Impact: Products from unstable processes (Cpk < 1.33) reach customers, leading to assembly and fitment issues.

4. MSA (Measurement System Analysis) – 20% Compliance

- Statistics: Proper Gage R&R analysis is implemented in only 3 enterprises; GRR values often exceed 30%.
- Case Example: Measurement error from a faulty caliper resulted in 5,000 defective parts being accepted, causing USD 50,000 in losses.

5. PPAP (Production Part Approval Process) – 80% Compliance

- Explanation: High compliance is driven by strict UzAuto Motors requirements.
- Observation: Documentation quality does not always reflect actual serial production quality, as samples are often specially prepared.

Quality Performance Indicators and Economic Losses

The inefficiency of QMS has a direct negative impact on economic performance. Based on audit data, the Cost of Poor Quality (COPQ) was calculated.

Table 1. Comparative Analysis of Quality KPIs

KPI	Global Benchmark (Toyota, GM)	Local Suppliers (Average)	Worst Case	Gap
Customer defects (PPM)	20–50	250–400	1500+	8–10× worse
Scrap rate	<0.5%	1.8%	4.5%	3–4× worse
Rework	<1.0%	5.0%	12.0%	5× worse
Complaint response time	24 hours	5 days	15 days	500% slower
OEE	>85%	65%	40%	20% loss

Economic Impact

On average, local enterprises lose 3–5% of annual turnover due to poor quality. For a company with annual revenue of 100 billion UZS, this translates into 3–5 billion UZS of direct losses, which could otherwise be invested in innovation and workforce motivation.

Conclusion

The in-depth GAP analysis demonstrates that quality management systems in Uzbekistan's automotive supplier enterprises are in a state of "evolutionary stagnation." While the external shell of compliance (certificates and PPAP documentation) aligns with international standards, the internal operational mechanisms—FMEA, SPC, MSA, and continuous improvement—remain outdated and ineffective.

Key Challenges Identified:

1. Lack of digitalization and unreliable data.
2. Superficial risk management practices.
3. Insufficient personnel competencies.

Addressing these challenges requires more than cosmetic improvements such as training or document updates. A fundamental transformation based on AHP/ANP decision-making models and digital quality platforms is necessary. These findings provide the critical empirical foundation for the solution framework proposed in subsequent chapters of the dissertation.

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