CQI-20
Effective Problem Solving Practitioner Guide
1st Edition

The Catalyst for Peak Performance

AIAG
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Founded in 1982, AIAG is a globally recognized organization where OEMs and suppliers unite to address and resolve issues affecting the worldwide automotive supply chain. AIAG’s goals are to reduce cost and complexity through collaboration; improve product quality, health, safety, and the environment; and optimize speed to market throughout the supply chain.

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- 1 -
CQI-10 AIAG Effective Problem Solving Guideline

Letter of Endorsement

Quality of product is of paramount importance to customer satisfaction and market competitiveness. Effective Problem Solving directly impacts product quality and company profitability.

Currently, companies use their respective problem solving processes and methods to comply with customer and certification requirements. Generally, problem solving results address the immediate issue and serve to satisfy the customer for the short term. While some organizations have developed problem solving processes that are robust and effective, all companies should pursue the opportunity to evaluate their processes and identify opportunities for improvement.

The Effective Problem Solving Guideline represents a consensus of the problem solving methodology and concepts used today by automotive OEMs and the supply chain. This consensus of problem solving methodology should improve the consistency of problem solving results in all segments and at all levels of the industry.

Enhancing the fundamental structure of this consolidated problem solving process is the integration of cultural behaviors that challenge company management to consider problem solving as a strategic planning tool to achieve business success.

The impact of effective problem solving extends beyond the immediate issue. Taking the experience and lessons from an issue and implementing them throughout an organization for similar products and processes will reduce the risk of recurrence and proactively improve first-time quality.

In addition, eliminating recurrent problems directly impacts profitability by improving cost-of-quality measures. As competitive pressures force efficiency improvements, the effective execution of problem solving reduces the waste of repetitive problem solving action.

Many company problem solving processes have structured methods, nomenclature, and verbiage that are unique and institutionalized. We suggest that the concepts and principles of the Effective Problem Solving Guideline be used as a benchmark for comparison to identify opportunities for improvement.

Through this endorsement, the following OEM and Tier 1 manufacturers expect that suppliers or producers of automobile systems, components, or material consider how the intent and principles of the Effective Problem Solving Guideline can be applied within their existing problem solving processes.

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This is a preview of "AIAG CQI-20:2012". Click here to purchase the full version from the ANSI store.
Members of the Automotive Industry Action Group (AIAG) Problem Solving Work Group developed this *Effective Problem Solving (EPS) Practitioner Guide* for AIAG member companies and their supplier community to use for improving overall customer satisfaction and industry-wide competitiveness by improving quality and reducing costs.

We are all *problem solvers* at some level. EPS is applicable across the enterprise within a company, at all levels from the boardroom to the factory floor. EPS can be used to solve all types of problems, including those affecting production parts, transactional business processes, and the design of new or revised parts and processes.

A meeting with Key Supplier Executives in August 2002 was held to determine the opportunity to define a common set of information associated with *Problem Solving*. It was agreed that this was a worthwhile effort, so over the next six months a series of team meetings were held to create the common data elements. The team consisted of Original Equipment Manufacturer (OEM) and Supplier *Problem Solving* Experts and Executives. The results of their work were presented to the AIAG Quality Steering Committee in February 2003.

While the common data elements were agreed upon, it was clear that more than data is needed to solve problems. The problem statement agreed upon was this:

A large amount of waste is generated in the automotive industry due to ineffective *problem* solving. Contributors to the waste include:

- Lack of Communications
- Insufficient Skills
- Entrenched *Culture* (industry and company)

Member companies of the Automotive Industry Action Group (AIAG) recognized a need to improve their *product* quality, reduce costs, and eliminate waste by strengthening their *problem* solving *culture*, *process*, skills, and supportive tools. An AIAG *Problem Solving* Work Group was formed to develop this *Effective Problem Solving (EPS) Practitioner Guide* in order to address this need.

The primary objectives of this edition of the document are to assist AIAG member companies to:

- Provide a recommended effective *problem* solving process that can be used as a model *problem* solving process for companies that have not yet adopted a *process* of their own.
- Provide a benchmark to compare existing *problem* solving *processes* and identify current gaps or deficiencies that should be addressed.
ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

ABOUT AIAG .......................................................................................................................................................... 1

1ST EDITION LETTER OF ENDORSEMENT ........................................................................................................ 3

FOREWORD, 2ND EDITION..................................................................................................................................... 4

ACKNOWLEDGEMENTS .......................................................................................................................................... 5

TABLE OF CONTENTS .......................................................................................................................................... 6

INTRODUCTION ..................................................................................................................................................... 9

APPLICATION ........................................................................................................................................................ 10

IS / IS NOT FOR PROBLEM SOLVING PROCESS .......................................................................................... 11

1 PROBLEM SOLVING ROLES ................................................................................................................................ 13

1.1 EXECUTIVE CHAMPION .............................................................................................................................. 13

1.2 TEAM LEADER ............................................................................................................................................. 13

1.3 TEAM ............................................................................................................................................................. 13

1.4 FACILITATION ............................................................................................................................................... 14

1.5 RECORD KEEPING ...................................................................................................................................... 14

2 EFFECTIVE PROBLEM SOLVING PROCESS ................................................................................................... 17

2.1 PROBLEM IDENTIFICATION .......................................................................................................................... 18

2.2 INITIATE CONTAINMENT ............................................................................................................................ 23

2.3 DETERMINE FAILURE MODE ..................................................................................................................... 26

2.4 ROOT CAUSE ANALYSIS ............................................................................................................................ 29

2.5 CORRECTIVE ACTION .................................................................................................................................. 36

2.6 IMPLEMENT PREVENTIVE ACTION ............................................................................................................. 41

APPENDICES ....................................................................................................................................................... 45

APPENDIX A: EFFECTIVE PROBLEM SOLVING REPORTING FORMAT FOR PRODUCT .............................................. 47

APPENDIX B: PROBLEM SOLVING TOOL MATRIX .......................................................................................... 51

APPENDIX C: PROBLEM SOLVING TOOL DESCRIPTIONS .................................................................................. 53

C1. CAUSE-AND-EFFECT MATRIX ..................................................................................................................... 54

C2. CONCENTRATION DIAGRAM ....................................................................................................................... 56

C3. DECISION MATRIX .................................................................................................................................... 57

C4. DESCRIPTIVE STATISTICS .......................................................................................................................... 60

C5. ERROR-PROOFING/MISTAKE-PROOFING .............................................................................................. 62

C6. PROCESS FLOW CHART ............................................................................................................................. 65

C7. MULTI-VARI ANALYSIS ............................................................................................................................... 69

C8. REPLICA TION / READ ACROSS ............................................................................................................... 72

C9. TAGUCHI - ROBUST DESIGN ...................................................................................................................... 75

APPENDIX D: DEFINITIONS AND ACRONYMS .................................................................................................. 79
Table of Figures

FIGURE 1. PRIMARY FOCUS FOR A FORMAL PROBLEM SOLVING PROCESS ............................................................ 10
FIGURE 2. OVERLAPPING PHASES IN PROBLEM SOLVING ......................................................................................... 10
FIGURE 3. COMPLEX PROBLEM SOLVING FLOW – HIGH LEVEL ...................................................................................... 15
FIGURE 4. PROBLEM IDENTIFICATION ........................................................................................................................ 18
FIGURE 5. CONTAINMENT .............................................................................................................................................. 23
FIGURE 6. FAILURE MODE ANALYSIS .......................................................................................................................... 26
FIGURE 7. ROOT CAUSE ANALYSIS .............................................................................................................................. 29
FIGURE 8. WHY? ............................................................................................................................................................... 30
FIGURE 9. FISHBONE DIAGRAM – QUALITY (EXAMPLE) ................................................................................................. 32
FIGURE 10. CORRECTIVE ACTION ................................................................................................................................ 36
FIGURE 11. PREVENTIVE ACTION .................................................................................................................................. 41
FIGURE 12. SUGGESTED EFFECTIVE PROBLEM SOLVING REPORTING FORMAT ......................................................... 47
FIGURE 13. EFFECTIVE PROBLEM SOLVING REPORTING FORMAT PG. 2 (CONTINUED) .......................................................... 48
FIGURE 14. EFFECTIVE PROBLEM SOLVING REPORTING FORMAT - EXAMPLE ................................................................. 49
FIGURE 15. EFFECTIVE PROBLEM SOLVING REPORTING FORMAT PAGE 2 (CONTINUED) ...................................................... 50
FIGURE 16. CONCENTRATION DIAGRAM OF A VEHICLE DOOR ........................................................................................ 56
FIGURE 17. VARIANCE FORMULAS .................................................................................................................................. 60
FIGURE 18. STANDARD DEVIATION FORMULAS .................................................................................................................. 61
FIGURE 19. INERTIA BRAKE POKA-YOKE .......................................................................................................................... 63
FIGURE 20. ERROR-PROOFING/MISTAKE PROOFING ................................................................................................. 64
FIGURE 21. LAB TEST REQUEST MAP .......................................................................................................................... 66
FIGURE 22. PROCESS FLOW THROUGH S101 (STATION 1, OPERATION 1) ........................................................................ 68
FIGURE 23. MULTI-VARI PLOT FOR A VALVE DIAMETER PROBLEM .................................................................................. 70
FIGURE 24. READ ACROSS / REPLICATION WORKSHEET ............................................................................................... 74
FIGURE 25. IDEAL FUNCTION VS. REALITY ........................................................................................................................ 76
FIGURE 26. PARAMETER DIAGRAM .................................................................................................................................. 76
FIGURE 27. ORTHOGONAL ARRAY WITH OUTSIDE NOISE ARRAY ....................................................................................... 77
FIGURE 28. SIGNAL TO NOISE (S/N) RATIO ........................................................................................................................ 77
FIGURE 29. FUNCTION AFTER S/N REDUCTION VS. FUNCTION AFTER MEAN ADJUSTMENT ................................................ 78
FIGURE 30. CONTAINMENT PROCESS .............................................................................................................................. 86
FIGURE 31. CONTAINMENT PROCESS (CONTINUED) ........................................................................................................ 87

Table of Tables

TABLE 1. IS / IS NOT ANALYSIS .............................................................................................................................................. 11
TABLE 2. PROBLEM IDENTIFICATION QUESTIONS .............................................................................................................. 20
TABLE 3. RECOMMENDED PROBLEM-SOLVING TOOLS BY PHASE (FIGURE 3) ................................................................. 51
TABLE 4. CAUSE-AND-EFFECT MATRIX ............................................................................................................................ 55
TABLE 5. DECISION MATRIX FOR THE PURCHASE OF A HOUSE ......................................................................................... 59
TABLE 6. MATERIALS ROUTING AND OPERATION DESCRIPTION ........................................................................................ 67
TABLE 7. EXAMPLE: WORKSHEET TO CAPTURE CONTAINMENT DATA .................................................................................. 88
INTRODUCTION

When solving problems, dig at the roots instead of just hacking at the leaves.

- Anthony D’Angelo

Effective Problem Solving (EPS) process can be defined as a process, when applied effectively will identify the Root Causes of problems or incidents. The general practice of EPS is based on the premise that problems are more effectively solved by identifying, correcting and ultimately eliminating the underlying Root Cause, rather than addressing the obvious symptoms. True application of the EPS process assumes that once the root cause has been identified the organization must have a Corrective Action Process that provides controls that keeps the problem from reoccurring or minimizing the possibility of it reoccurring. A key concept, when applying the EPS process is the understanding that it is unlikely that there will be complete prevention of the root cause by a single intervention. EPS is an ongoing process that needs to be effectively integrated with an organizations corrective action and continuing improvement process.

The EPS process by nature is a reactive process. When the organization first approaches the implementation of EPS, it is based on the response/reaction to some current identifiable failing within a process or a specific activity. This means that the problem has already occurred and the processes initiation is a response to that occurrence. As the organization improves the EPS process they will move from reactive to predictive. The ultimate goal of an effective EPS process is to apply the learning to predict failures so that preventive measures can be implemented BEFORE they can occur. This will lead to a culture for effective problem solving over time.

The EPS process is specifically designed to facilitate, in the organization, a means for the establishment of a systematic investigation of undesired outcomes (Failure Modes), problems or accidents (Hypothetical or actual, mistakes and errors).

The EPS process must emphasize the need for planning and follow-through. CAPA (Corrective Action/Preventive Action) is an integral part of the EPS process in its ability to provide a powerful means of understanding, any situation and generating a process for the solving the problems as well as generating possible solutions.

The use of the EPS along with CAPA can and should be used as an integral means for the updating of the FMEA, as well as linking to the standards (ISO 9000:2008, AS9100C & ISO/TS16949:2009) as it relates to the use of Mistake Proofing and Problem Solving.

Note: Words that appear in italic type font herein except for titles of documents are defined in the glossary.
Applicability

Problems vary in terms of complexity. Kaoru Ishikawa reportedly stated that a large majority of quality related problems...can be solved with seven fundamental quantitative tools. These are Fishbone Diagrams, Histograms, Pareto Analysis, Flowcharts (Value Stream Maps), Scatter Plots, Run Charts and/or Control Charts.

However, some problems can be more complex with a number of potential causes to be discovered and addressed. These require a cross-functional team using a formal problem-solving process to address. This document is focused on the more complex problems where a team is needed. Even for problems that an individual can solve, they should use a structured problem solving process.

The detailed process for resolving any one complex product design problem, e.g. tolerance “stack up” is outside the scope of this manual.

- 10 -
IS / IS NOT for Problem Solving Process

The following is an application of one of the analysis tools which can be used in the Effective Problem Solving (EPS) process. This IS / IS NOT analysis summarizes the scope and applicability of this EPS guidebook.

Table 1. Is / Is Not Analysis

<table>
<thead>
<tr>
<th>IS</th>
<th>IS-NOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested Standard format available</td>
<td>Mandated / required</td>
</tr>
<tr>
<td>Recommended problem solving process with reference to applicable tools</td>
<td>Focused on teaching individual tools</td>
</tr>
<tr>
<td>Used for solving complex problems</td>
<td>Used for solving simple concerns</td>
</tr>
<tr>
<td>A guideline</td>
<td>Detailed specific process(s) to use for customer- and company- specific issues</td>
</tr>
<tr>
<td>Generic process that can be used for any type of problem</td>
<td>Just for design and / or product related problems</td>
</tr>
<tr>
<td>Provides detailed explanation of process steps</td>
<td>Only a high level summary of the process steps</td>
</tr>
<tr>
<td>Used by all employees at all levels of an organization</td>
<td>Only specific to Engineers</td>
</tr>
<tr>
<td>Intended to prevent problem recurrence</td>
<td>Focused on containment or &quot;firefighting&quot;</td>
</tr>
<tr>
<td>Defines team roles</td>
<td></td>
</tr>
<tr>
<td>Provides guidance for when and how to engage the supplier and customer</td>
<td></td>
</tr>
<tr>
<td>AIAG and Project Team consensus</td>
<td>Compilation of what the industry does today</td>
</tr>
<tr>
<td>Deliverables include minimum set of questions for all process steps</td>
<td></td>
</tr>
</tbody>
</table>
1 PROBLEM SOLVING ROLES

1.1 Executive Champion

Senior management cannot legitimately delegate responsibility for quality. This guideline provides quality practitioners in organizations with an effective process for problem solving and root cause analysis. The Executive Champion (or similar title, e.g. Sponsor) is the “voice of top leadership” in the process. This is critical to successful problem solving by demonstrating management support to the team and to the organization at large. In this role, the Executive Champion is responsible for:

- Allocation of resources, e.g. both in quantity and appropriate function
- Monitoring team progress
- Removal of road blocks,
- Ensuring corrective actions are timely and effective.

Reference the AIAG Role of the Leader Guideline, target publication Sept. 2012 for more specific direction applicable to leaders.

1.2 Team Leader

The team leader should be the natural owner of the process involved. This role may change as the team works on the problem identification. The Quality function should be a facilitator and resource to the team, but not function as the natural owner. For example, Product Engineering should own product design problems. Manufacturing or Industrial Engineer functions should own process problems. The natural owner is responsible for the approval and execution of the corrective action. The natural owner can also be a facilitator for the team. Reference the AIAG Role of the Leader Guideline, target publication Sept. 2012 for more specific direction applicable to leaders.

1.3 Team

The team is directly involved and responsible for the recurrence prevention in effectively solving the specific problem. The team includes any subject matter experts as needed and goes into the investigation “unbiased.” Do not assume the root cause or responsibility prior to gathering evidence to make a data-based decision. However, the team will need hypotheses in order to gather the needed data to prove or disprove the hypotheses.

Note that the term “team” means participants from all affected functions, e.g. manufacturing, engineering, purchasing, supplier quality and/or management. To be effective, the team should be the appropriate size for the problem identified. This could include customers and/or suppliers as
applicable.

The team should ensure roles and responsibilities are assigned to address all the necessary steps in the problem solving process. Responsibilities for containment should be designated separate from responsibilities for root cause analysis so proper focus is placed on recurrence prevention.

1.4 Facilitation

The facilitator role may be optional but should be used for most complex problems (see Figure 1). The facilitator should

- ensure that the team is represented by all the appropriate functions.
- be independent, i.e., no equity in the problem so they can facilitate the meetings effectively.
- be a problem-solving process subject matter expert, but not necessarily be a content expert regarding the actual problem being worked on.

The facilitator is responsible for convening the meetings, leading effective meetings in support of the natural owner of the problem, ensuring that minutes are published on time and following action items. In the absence of a facilitator, the team will have to assign someone to perform these functions.

1.5 Record Keeping

An individual needs to be designated the responsibility for maintaining the meeting records and minutes. They are responsible to ensure that the minutes are distributed to the appropriate people and to make corrections if necessary. It is recommended that, if the process is to be extensive and time consuming that this position be rotated. It is also recommended that this position NOT necessarily be assigned to an administrative assistant.
Complex Problem Solving Flow Diagram

Inputs
- VOC – Voice of the Customer
- VOP – Voice of the Process
- VOE – Voice of Experience

Disruption to Requirement

Outputs
- Problem Solving Statement
- Containment Plan
- Containment of Symptom
- Escape FM
- Occurrence FM
- Systemic FM

Initiation of Complex Problem Solving

Problem Solving Statement

Problem Solving Statement

FMEA

Failure Mode (FM) Analysis

Containment Process

Root Cause (RC) Analysis

Corrective Action (CA)

Preventive Action (PA)

Notify Customer (As Appropriate)

True Root Causes for:
- Escape
- Occurrence
- Systemic

Verified Escape CA
Verified Occurrence CA
Verified Systemic CA
Key Findings
Lessons Learned

PA Deployed
Update Process Documents

Figure 3. Complex Problem Solving Flow – High Level
2 EFFECTIVE PROBLEM SOLVING PROCESS

The recommended process is designed to assist you in clearly defining the problem, determining the actual root cause(s) of the problem, developing corrective action(s) to address all root causes, and institutionalizing these actions within an organization.

This section will detail the process flow within each of the overall steps represented in Figure 3. Each process flow will be accompanied by key questions that should be asked and answered as part of completing that step in the recommended problem solving process. The questions are provided to guide problem solvers and leaders through each step to achieve the best outcome.

Although there is no required problem solving reporting format, most organizations do require the following minimum information:

- Problem Identification
- Containment
- Root Cause Analysis
- Corrective Action
- Verification of effectiveness
2.1 Problem Identification

**Input**
Initiation of Complex Problem Solving

**Output**
Problem Identification

![Problem Identification Diagram]

Figure 4. Problem Identification

### 2.1.1 Introduction

For complex *problems* (See Figure 1), the organization should initiate their formal *corrective action process*. The scope of this *process* starts with the voice of the customer or of the *process* which signal that there is a non-conformance. As stated earlier, the focus for guidance in this manual is for complex *problems* where a formal *process* with a cross-functional team is needed. Operators from the floor can often be used to represent the voice of the *process*. The customer may need to be notified early and even participate on the team in some cases.

### 2.1.2 Initiate Team

One of the first steps for the formal *problem solving process* is to form a cross functional team. The team should have an Executive Champion or sponsor as well as be led by the natural owning function, e.g. engineering, manufacturing. The Quality function should be a key support function for the team. Other internal functions, e.g. logistics should be involved as applicable.

There are key issues when selecting and implementing the EPS Team that must be reviewed and applied.

The team should:

- Consist of *subject matter experts*; (This can include the use of outside content experts, such as consultants.)
- Consist of a group of people with *process* and *product* knowledge and the authority to correct the *problem* and participate in the meetings;
- The selected team members must be empowered by Senior Management to “change the rules” and “think outside the box”;
- Have an appointed Team Champion.

Team membership could change over time, but some should remain with the team throughout the *process*. There must be: