CQI-20

Effective Problem Solving Practitioner Guide

1st Edition

›› Insight

›› Expertise

›› Results

The **Catalyst** for Peak Performance

AIAG

ABOUT AIAG

Purpose Statement

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.

AIAG Organization

AIAG is made up of a board of directors, an executive director, executives on loan from member companies, associate directors, a full-time staff, and volunteers serving on project teams. Directors, department managers, and program managers plan, direct and coordinate the association's activities under the direction of the executive director.

AIAG Projects

Volunteer committees focus on business processes or supporting technologies and methodologies. They conduct research and develop, publish, and provide training on standards, conventions, standard business practices, white papers, and guidelines in the areas of automatic identification, CAD/CAM, EDI/electronic commerce, continuous quality improvement, health focus, materials and project management, occupational health & safety, returnable containers and packaging systems, transportation/customs and truck & heavy equipment.

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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 *process*es and methods to comply with customer and certification *requirement*s. 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 *process*es that are robust and effective, all companies should pursue the opportunity to evaluate their *process*es 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 *product*s and *process*es will reduce the risk of recurrence and proactively improve first-time quality.

In addition, eliminating recurrent *problem*s 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.
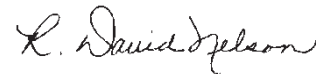
Through this endorsement, the following OEM and Tier 1 manufacturers expect that suppliers or producers of automobile systems, components, or material consider how the intent and principles of the *Effective Problem Solving Guideline* can be applied within their existing *problem* solving *process*es.
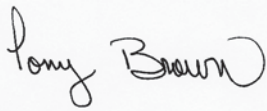
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FOREWORD

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.

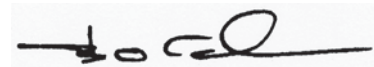We are all *problem solvers* at some level. EPS is applicable across the enterprise within a company, at all levels from the boardroom to the factory floor. EPS can be used to solve all types of *problems*, including those affecting production parts, transactional business *processes*, and the design 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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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
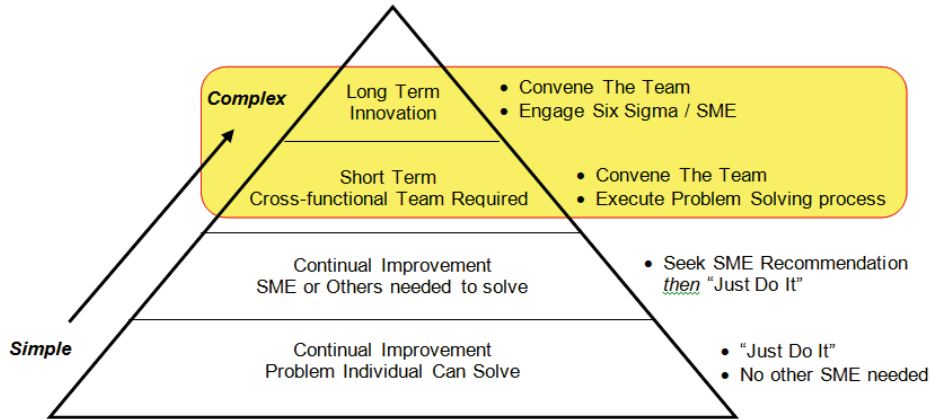
Figure 1. **Primary Focus for a Formal Problem Solving Process**

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.
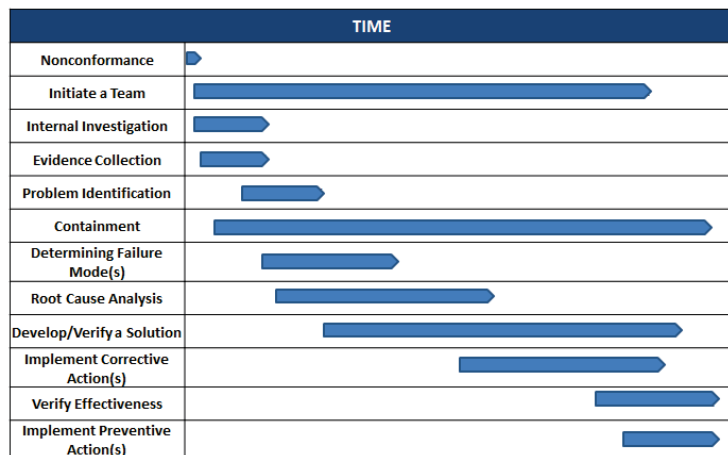
Figure 2. **Overlapping Phases in Problem Solving**

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

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

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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

Outputs

Initiation of Complex Problem Solving

Problem Identification

Problem Solving Statement

Problem Solving Statement

Containment Process

Containment Plan
Containment of Symptom

Problem Solving Statement
FMEA

Failure Mode (FM) Analysis

Escape FM
Occurrence FM
Systemic FM

Escape FM
Occurrence FM
Systemic FM

Root Cause (RC) Analysis

True Root Causes for:
Escape
Occurrence
Systemic

True Root Causes for:
Escape
Occurrence
Systemic

Corrective Action (CA)

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

Verified Escape CA
Verified Occurrence CA
Verified Systemic CA
Key Findings

Preventive Action (PA)

PA Deployed
Update Process Documents

Notify Customer (As Appropriate)

Disruption to Requirement

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
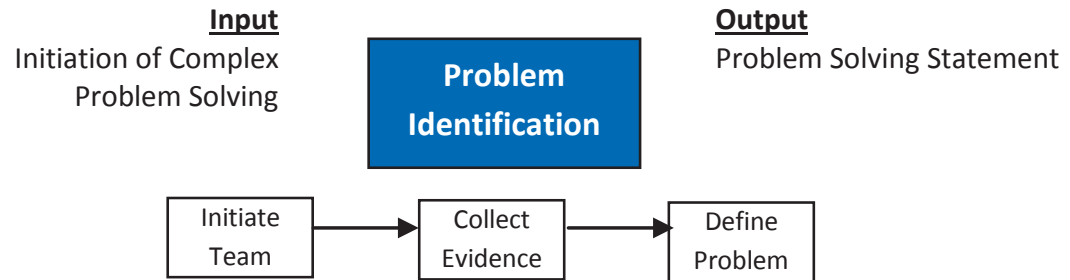
2.1 Problem Identification

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: