

FAILURE MODE and EFFECT ANALYSIS

What it is:

Failure mode and effect analysis is a tool that examines potential product or process failures, evaluates risk priorities, and helps determine remedial actions to avoid identified problems. The spreadsheet format allows easy review of the analysis.

When to use it:

Failure mode and effect analysis is primarily a quality planning tool. It is useful in developing features and goals for both products and processes, in identifying critical product/process factors and designing countermeasures to potential problems, in establishing controls to prevent process errors, and in prioritizing process subunits to ensure reliability.

How to use it:

Create a nine-column spreadsheet. Label the columns as indicated in the example below: Mode of Failure, Cause of Failure, Effect of Failure, Frequency of Occurrence, Degree of Severity, Chance of Detection, Risk Priority, Design Action, and Design Validation.

Use brainstorming to identify all possible modes of failure. List each mode on a separate line in column 1.

Identify all possible causes of failure for each mode. Use brainstorming to create a list of these causes and add them in column 2.

Determine the likely effect of each failure. In column 3, identify the potential impact of failures on the customer, the product, or the process.

Create a table of assigned values. For columns 4, 5, and 6, develop a consensus table of relative values for assumed frequency of occurrence, the severity of the failure for the customer, and the likelihood of detecting the problem.

Record appropriate values in columns 4, 5, and 6. Using the table of assigned values, develop a consensus score for frequency of occurrence, the severity of the failure, and the chance of detection for each cause of failure.

Calculate the risk factor for each cause of failure. For each cause of failure, multiply the numbers in columns 4, 5, and 6. Record the product in column 7.

Identify a remedy for critical failure modes. Concentrate on the small number of failure causes that can dramatically impact the product/process, and design actions that will significantly reduce the level of failure.

Validate each action/remedy. Design a method of verifying that the remedy is in place and is used.

Failure Mode and Effect Analysis Example

Product: Stand-Alone Computer Station

Component: Hardware Installation

1	2	3	4	5	6	7	8	9
Mode of Failure	Cause of Failure	Effect of Failure	Frequency of Occurrence (1-10)	Degree of Severity (1-10)	Chance of Detection (1-10)	Risk Priority (1-1000) [4] x [5] x [6]	Design Action	Design Validation
Hardware not installed on time	Shipping delay from manufacturer	Customer loses time/\$	2	6	8	96	Agent reviews timeline with supplier	Agent initials order form
	Inaccurate estimate of time required	Customer loses time/\$	3	4	1	12		
	Unavailable/overscheduled installers	Customer loses time/\$	6	4	3	72		
	Missing components	Customer loses time/\$	5	7	5	175	Installers verify components needed for job	Installer initials preliminary checklist for job
Hardware not installed properly	Inexperienced installers	Hardware must be reinstalled	1	8	10	80		
	Customer requirements not clear	Hardware must be reinstalled	7	8	7	392	Installer meets/calls customer to verify design	Customer & installer initial checksheet

Assigned Values for Columns 4-6

column/value	1	2	3	4	5	6	7	8	9	10
4. Frequency (errors/100 customers)	<2	4	6	8	10	12	14	16	18	>20
5. Severity for Customer	Trivial			Complaint			Major time/\$			Loss of customer
6. Probability of Detection	Certain				Possible					None