

Proactive Identification of Critical Points to Quality and Safety by 2^k Factorial Design

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Abstract: This paper presents a new method called 2^k factorial design for proactively identifying Critical to Quality (CTQ) and also safety before Complaints by customer or before the Voice of Customer (VOC).

Keywords: Critical to Quality (CTQ) and Voice of Customer (VOC).

1. Introduction

Incidents can happen from different causes, considering the incidents as CTQ and causes as inputs (X's) We can improve safety and quality by identifying the CTQ and Xs proactively. Currently CTQs and X's can be identified by cause-and-effect analysis by following methods.

- i. VOC (Voice of Customer)
- ii. Brainstorming
- iii. Flow Chart.
- iv. Cause and effect matrix.

In this new method we can identify all the CTQ's and X's and relationship between them effectively before VOC.

2. Guidelines

Take an example, we have 3Nos. of Causes for different quality and safety problems(effects). Degree of relationship can be measured by all possible problems to causes by 'Cause and effect matrix' based on VOC. But the new method presenting here identifies the problem proactively before the VOC.

3. Tables

Table1

Cause and effect Matrix: Finding Relationship between CTQ's and X's After Voice of customer

	X1, Weight of Grinding Machine	X2, Handling	X3, Type of Switch(Dead Man Switch)
CTQ 1 (Accessibility)	●	●	○
CTQ 2(Functionality)	●		

● = 9 strong relationship.
 ○ = 6 Moderate relationship.
 △ = 3 Weak Relationship
 0 = No relationship(Blank cell)

Only we have two VOC, CTQ 1, and CTQ 2 Accessibility and functionality. But proactively before voice of customer we can find the all types of CTQ's and X's and relationship between them.

Table2

Cause and effect Matrix new format: Proactively Finding Relationship between CTQ's and X's before the Voice of customer by 2^k factorial design.

X1, Weight of Grinding Machine	X2, Handling	X3, Type of Switch(Dead Man Switch)	CTQ' s	Degree of Relationship Between CTQ and each X	Degree of Relationship between CTQ and X Rating
+	+	+	Functionality, Accessibility and Safety	●	9
+	+	-	Accessibility	●	9
+	-	-	Accessibility	△	3
-	-	-	No interaction		0
-	-	+	Safety	○	6
-	+	+	Functionality and safety	○	6
+	-	+	Safety and accessibility	○	6
-	+	-	functionality	△	3

4. Results

It was clearly understood from Table 2 that We identified all CTQs prior to the Voice of Customer (VOC), Which should be expected CTQs from VOC. Here comes new CTQ as Safety which was not there in Table 1.

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5. Conclusion

Proactive identification of Critical points to Quality and Safety by 2^k Factorial Design, also establishing relationship between CTQ and Xs helps us in selecting Xs with high risk identified on a Table2: Cause and effect Matrix new format. Identified high risk X's are input into a failure mode effect analysis (FMEA). FMEA is a tool used to identify, estimate, prioritize, and reduce risk of failure in CTQ's through the development of actions (Process changes) and contingency

plans based on Xs.

References

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