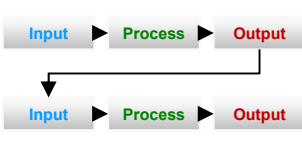


Define

Relevance of Topic: 36%

Suitable for: Six Sigma

Own contribution: 80%



Voice of Customer & Business

Requirements and Deviations

Severity of Problems of Outputs

Project-Charter	
Business Relevance	Problem
Scope/ Objectives	Experts Belt-Team Management

Input

Requirements and deviations

negative Influences on Problems

Process-Steps > Activities

Input, Output, Methods & Resources

negative Influences on Problems

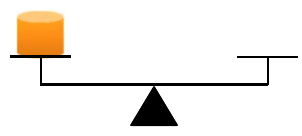
		Problems (Y)			
		Y1	Y2	Y3	Yn
Input (Xi)	Xi1		3		
	Xi2				1
Process-Steps (Xp)	Xp1	2		4	
	Xp2				5
	Xpn		7		

Problems (Y)	Operationalisation		Graphical Display	
	Y1	Y2	Y3	Yn
Input (Xi)	Xi1	Xi2	Xin	
Process-Steps (Xp)	Xp1	Xp2	Xpn	

Risk: 14%

There is a/ no Difference in: the degree of: (Y) ... between: Levels of: (x)

Test: ANOVA



12

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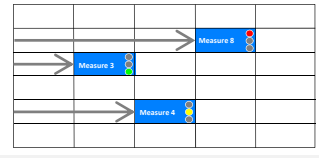
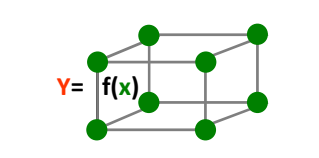
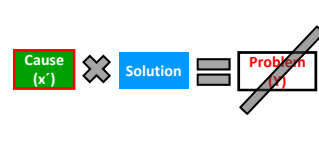
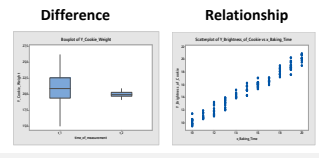
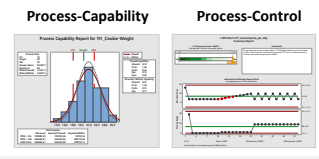
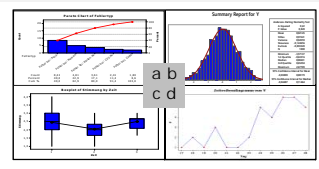
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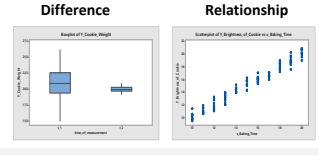
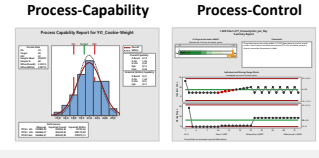
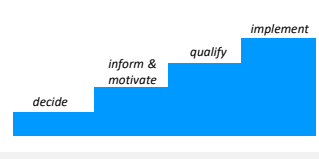
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Analyse



Measure	Who?	What?	until When?
Measure 1			
Measure 2			
Measure 3			
Measure 4			



Plan Process Monitoring and Out of Control Measures	Document Project and present Results	Define Standards for the new Process
Start Continuous Improvement (CIP)	Continue checking Target Achievement	Continue checking Process Capability

Improve

Control

Measure

Identify Project

- collect Topics
- evaluate Topics
- prioritize Topics
- select Project

Define Project

- Process and Output
- Problem
- Effect
- Solution ideas (if present)

SIPOC (Supplier-Input-Process-Output-Customer)

- structure Process into main the main process steps
- assign Inputs and (intermediate) Outputs
- assign Supplier and Customer

VoC/ VoB > CCR/ CBR > CtQ

- interview Customer/ Manager
- derive requirements for Outputs and evaluate their deviations
- derive severity of Problems Y of the Output

Project-Charter

- focus on critical Problems Y
- specify their business relevance
- define scope and objectives
- build a team

Input-Analysis

- identify necessary Inputs
- specify the requirements
- specify negative Influences xi on the Problems of the Output Y

Process-Mapping & -Analysis

- map Process-Steps into Activities
- assign Inputs and Outputs
- specify Methods & Resources
- specify negative Influences xp

Cause & Effect-Matrix (C&E)

- evaluate impact strength of the negative Influences of Inputs xi and Activities of the Process xp on Problems of the Outputs Y

Data Collection Plan

- operationalize Influences xi, xp and Problems Y as measurands
- determine scale level
- determine conditions and procedure of measurement

Hypothesis

- automatically generated with:
 - type of Hypothesis (Difference/ Relationship)
 - relevance of Hypothesis (Risk)
 - appropriate statistical test

Measurement-System-Analysis

- check repeatability, reproducibility, stability and linearity of the measurement system
- Gage R&R

Collect Data

- collect existing data
- measure actual data

Graphical Analysis of Data

- a) Pareto-Diagram
- b) Histogram
- c) Boxplot
- d) Time Series Plot

Process-Capability/ -Control

- Yield%/ DPU/ DPMO
- Zbench (Sigma Level) / cp/ cpk ...
- I-MR/ xbar-R/ xbar-S/ P-/ U-Chart as baseline of the Process

Test Hypothesis

- Difference-Hypothesis: $Y_a \neq Y_b$
- Relationship-Hypothesis: $Y \neq f(x)$

Root-Cause-Analysis

- identify Root-Causes x' of the negative influences x on the Problems Y

Solution-Ideas

- develop Solutions to eliminate, circumvent or adjust parameter of the Root-Causes x'
- prioritize Solutions

Design of Experiments (DoE)

- adjust the parameter of Solutions optimally

Action-List

- specify Solutions as Measures (Who?/ What?/ until When?)

FMEA (Failure Mode and Effects Analysis)

- minimize Risks of Measures

Implementation

- decide on Measures
- inform and motivate
- qualify (if necessary)
- implement Measures

Process-Capability/ -Control

- Yield%/ DPU/ DPMO
- Zbench (Sigma Level) / cp/ cpk ...
- I-MR/ xbar-R/ xbar-S/ P-/ U-Chart for the improved Process

Test Hypothesis

- Difference-Hypothesis: $Y_a \neq Y_b$
- Relationship-Hypothesis: $Y \neq f(x)$

Handover and close Project

- Storyboard of Project
- Process-Management-Plan

Project Team:

- Management (Sponsor, Accountable) / Role: monitor, decide, support Project
- Belt (Black-Belt/ Green-Belt) / Role: lead Project
- Experts / Role: support Project

Tools:

- sigmaGuide®
- Minitab®

Copyright: reiner.hutwelker@softLogik.de

Define

Relevanz des Themas: 36%

Tauglichkeit für: Six Sigma

eigener Beitrag: 80%

Projekt identifizieren

- Themen einsammeln
- Themen bewerten
- Themen priorisieren
- Projekte auswählen

Projekt definieren

- Prozess und Output
- Problem
- Wirkung
- Lösungs-Ideen (falls vorhanden)

SIPOC (Supplier-Input-Process-Output-Customer)

- Prozess in die wichtigen Prozess-Schritte gliedern
- Inputs und (Zwischen-) Outputs zuordnen, ebenso wie Lieferanten und Kunden

VoC/ VoB > CCR/ CBR > CtQ

- Kunden/ Manager befragen
- Anforderungen an Outputs und deren Abweichungen ableiten
- Abweichungen bewerten und Schwere der Probleme Y ableiten

Project-Charter

- kritische Probleme Y fokussieren
- Business-Relevanz ableiten
- Scope und Ziele definieren
- Team zusammenstellen

Input-Analyse

- notwendige Inputs identifizieren
- Anforderungen an Inputs konkretisieren
- negative Einflüsse xi auf Probleme der Outputs Y ableiten

Prozess-Mapping & -Analyse

- Prozess-Schritte in Aktivitäten gliedern
- Inputs & Outputs, Methoden & Ressourcen zuordnen
- negative Einflüsse xp ableiten

Cause & Effect-Matrix (C&E)

- Stärke der negativen Einflüsse der Inputs xi und Aktivitäten im Prozess xp auf die Probleme des Outputs Y bewerten

Daten-Erhebungs-Plan

- Einflüsse x und Probleme Y als Messgrößen operationalisieren
- Bedingungen und Prozedur der Messung konkretisieren

Hypothesen

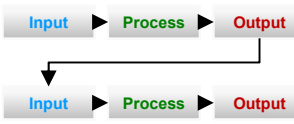
- automatisch erzeugt mit:
 - Typ der Hypothese (Unterschied/Zusammenhang)
 - Relevanz der Hypothese (Risiko)
 - angemessener statistischer Test

Mess-System-Analyse

- Wiederholbarkeit und Reproduzierbarkeit, Stabilität & Linearität des Mess-Systems prüfen
- Gage R&R

Daten erheben

- vorhandene Daten abrufen
- aktuelle Daten messen



Voice of Customer & Business

Anforderungen und Abweichungen

Schwere der Probleme des Outputs

Project-Charter	
Business-Relevanz	Problem
Scope/ Ziele	Experten Belt-Team Management

Input

Anforderungen und Abweichungen

negative Einflüsse auf Probleme

Prozess-Schritte > Aktivitäten

Input, Output, Methoden & Ressourcen

negative Einflüsse auf Probleme

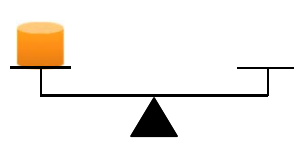
		Problems (Y)			
		Y1	Y2	Y3	Yn
Input (Xi)	Xi1		3		
	Xi2				1
	Xin			4	
Process-Steps (Xp)	Xp1	2			
	Xp2			5	
	Xpn		7		

		Operationalisation				Graphical Display			
		Y1	Y2	Y3	Yn	Y1	Y2	Y3	Yn
Problems (Y)	Y1								
	Y2								
	Yn								
Input (Xi)	Xi1								
	Xi2								
	Xin								
Process-Steps (Xp)	Xp1								
	Xp2								
	Xpn								

Risiko: 14%

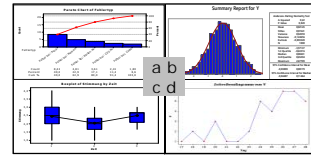
Es gibt (k)einen Unterschied in: Ausmaß von (Y) ... zwischen: Stufen von (x)

Test: ANOVA

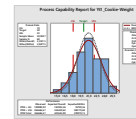


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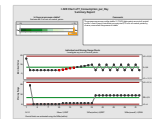
Analyse



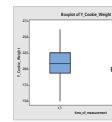
Prozess-Fähigkeit



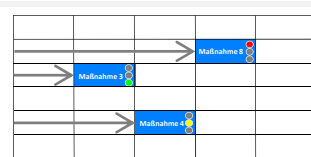
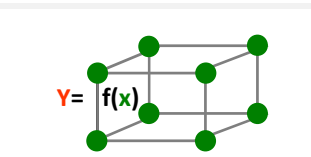
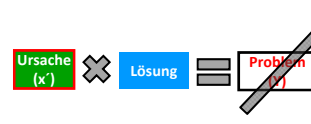
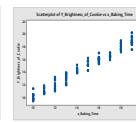
Prozess-Monitoring



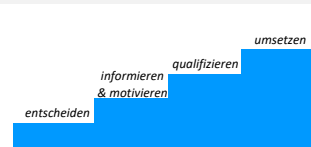
Unterschied



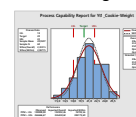
Zusammenhang



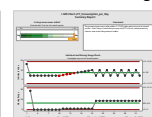
Problem	Ursache	Maßnahme	Ergebnis
		Maßnahme 1	
		Maßnahme 2	
		Maßnahme 3	



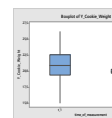
Prozess-Fähigkeit



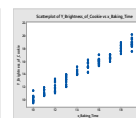
Prozess-Monitoring



Unterschied



Zusammenhang



graphische Analyse der Daten

- a) Pareto-Diagramm
- b) Histogramm
- c) Boxplot
- d) Zeitreihen-Diagramm

Prozess-Fähigkeit/-Monitoring

- Yield%/ DPU/ DPMO
- Zbench (Sigma Level) // cp/ cpk ...
- I-MR/ xbar-R/ xbar-S/ P-/ U-Chart als Baseline des Prozesses

Hypothesentests

- Unterschieds-Hypothese: $Y_a \neq Y_b$
- Zusammenhangs-Hypothese: $Y = f(x)$

Ursache-Wirkungs-Analyse

- Basis-Ursachen x' der negativen Einflüsse x auf die Probleme Y identifizieren

Lösungs-Ideen

- Lösungs-Ideen entwickeln, mit denen die Basis-Ursachen x' eliminiert, umgangen oder optimal justiert werden können
- Lösungsideen priorisieren

Design of Experiments (DoE)

- Parameter der Lösung optimal justieren

Maßnahmen-Liste

- Lösungen in konkrete Maßnahmen überführen (Wer?/ Was?/ bis Wann?)

FMEA (Failure Mode and Effects Analysis)

- Risiken der Maßnahmen minimieren

Umsetzung

- Entscheide über Maßnahmen
- informieren & motivieren
- qualifizieren (wenn notwendig)
- setze Maßnahmen um

Prozess-Fähigkeit/-Monitoring

- Yield%/ DPU/ DPMO
- Zbench (Sigma Level) // cp/ cpk ...
- I-MR/ xbar-R/ xbar-S/ P-/ U-Chart zur verbesserten Prozess-Leistung

Hypothesentests

- Unterschieds-Hypothese: $Y_a \neq Y_b$
- Zusammenhangs-Hypothese: $Y = f(x)$

Projekt abschließen

- Storyboard abschließen
- Prozess-Management-Plan übergeben

Measure

Improve

Control