Beyond

Capability

Confusion

Second Edition

Donald J. Wheeler



Contents

	About the Author			
	Preface to the Second Edition			
One	Introduction		1	
	1.1	The Specification Game	1	
	1.2	The Capability Game	2	
	1.3	Predicting the Future	3	
Two	The Four Possibilities for Any Process			
	2.1	Two Definitions of Trouble	5 5	
	2.2	The Four Possibilities	6	
	2.3	The Effect of Entropy	9	
	2.4	The Implications for Assessing Process Capability	11	
Three	Predictable and Unpredictable Processes			
	3.1	Two Types of Variation	13	
	3.2	Two Types of Action	14	
	3.3	Two Types of Process Behavior Charts	16	
	3.4	Implications for Assessing Process Capability	17	
Four	Capability for Predictable Processes			
	4.1	Capability	19	
	4.2	Capability Indexes	20	
	4.3	A Capability Checklist	23	
	4.4	Another Way to Think About the Capability Indexes	30	
	4.5	Converting Capability Ratios into Fractions Nonconforming	32	
	4.6	The Fraction Nonconforming When Capability Indexes Exceed 1.00	37	
	4.7	Summary	39	
Five	What Can Be Said for Unpredictable Processes?			
	5.1	Will Capability Ratios Characterize Unpredictable Processes?	41	
	5.2	Will the Percent Nonconforming Describe an Unpredictable Process?	43	
	5.3	What About Using Performance Indexes?	47	
	5.4	Hypothetical Capability	49	
	5.5	A Flowchart for Process Capability	50	
	5.6	Summary	52	

Six	Capability Ratios Vary		
	6.1	Capability Indexes Over Time	55
	6.2	Charting Capability Indexes is No Substitute for Charting the Process	59
	6.3	So What Do Capability Indexes Do?	60
Seven	What is Capability for Count Data?		
	7.1	Can We Calculate a Centered Capability Ratio?	62
	7.2	Capability for Count Data	62
Eight	The Costs of Using Conforming Product		
	8.1	The Problem of Production	65
	8.2	Tighten the Specifications	67
	8.3	Random Assembly with the Original Specifications	68
	8.4	Tweaking the Target Bearing Diameter	70
	8.5	Pre-Sorting the Parts	72
	8.6	The Effects of Reducing Variation at the Source	75
	8.7	Summary	78
Nine	The Ave	erage Cost-of-Use	81
	9.1	Variation Always Creates Costs	81
	9.2	A Loss Function	82
	9.3	A More Realistic Loss Function	84
	9.4	A First-Order Approximation for Any Realistic Loss Function	86
	9.5	The Average Cost-of-Use	88
	9.6	World-Class Quality	90
	9.7	Computing the Average Cost-of-Use for Your Process	93
	9.8	But What About a Loss Function That Is Not Symmetric?	99
	9.9	Tables of the Standardized Average Loss	101
	9.10	What About the C_{pm} Index?	108
	9.11	The Effective Cost of Production	111
	9.12	Summary	111
Ten	So What Do You Do Now?		
	10.1	The Capability Game	113
	10.2	World-Class Quality	113
	10.3	"Be Ye Warmed and Filled" Is Not Enough	114
	Appendix		
	Review Exercises		118
	Bibliography		129
	Computing the Standardized Average Loss		130
	Tables		
	Glossary		
	Answers		
	Index		141