TABLE 4.3 A SAMPLE CHANGE COUNTER DEVELOPMENT STRATEGY

Name _____ Date _____

Team Example Team B Data Instructor _____

Part/Level Change Counter/System Cycle 1

Reference	Functions	Cycle LOC			Cycle Hours		
		1	2	3	1	2	3
1.1	Compare modified program with prior version		X				
1.2	Identify added and deleted LOC		180			18	
1.3	Count added and deleted LOC			100			10
1.4	Count total LOC in modified program			X			
1.5	Attach line labels		50			5	
1.6	Provide change label header	50			5		
1.7	Maintain change record history in header		100			10	
1.8	Retain prior change history			X			
1.9	New program source file with change info.	120			12		
1.10	Write for one programming language	X					
1.11	Enhance to three languages						
1.12	Print program listing with change labels	50			5		
1.13	Print line numbers on listing		50	150		5	15
1.14	Print program change report			75			7.5
2.1	Count text lines with coding standard			X			
2.2	Count LOC with syntax counter						
2.3	Compare for added and deleted LOC		X				
2.4	Count changed lines as added and deleted		X				
2.5	Analyze added-deleted pairs for change LOC						
3.1	Comment header section	X					
3.2	List prior program modifications in order		X				
3.3	Count new programs as version 0		100			10	
3.4	Provide change information in label	50			5		
3.5	Provide change data in label	50			5		
3.6	For defect fixes, note fix number in label	X					
3.7	For enhancements, note project data in label	X					
4.1	Label each changed line with change number		150			15	
4.2	Retain deleted line in comment			150			15
4.3	Note previously deleted and added lines			50			5
4.4	Insert line numbers before listing lines						
4.5s1	Where lines too long, roll to next line		50			5	
4.5s2	Retain LOC count when rolling lines			150			15
4.6	Retain original program indenting						
4.7	Indent rolled lines to middle of listing		X				
	System control and overhead	185	50	100	18.5	5	10
Totals		505	730	775	50.5	73	77.5

TABLE 5.1 SAMPLE PLANNED-VALUE CALCULATIONS

Task	Plan Hours	Cumulative Hours	Plan Value (PV)	Cumulative PV
Launch and strategy	29.5	29.5	13.38	13.38
Planning	27.5	57.0	12.47	25.85
Requirements	17.0	74.0	7.71	33.56
System test plan	2.5	76.5	1.13	34.69
Requirements inspection	2.0	78.5	.91	35.60
High-level design	43.0	121.5	19.50	55.10
Integration test plan	2.0	123.5	.91	56.01
HLD inspection	5.0	128.5	2.27	58.28
Detailed design	14.0	142.5	6.35	64.63
Detailed design review	3.0	145.5	1.36	65.99
Test development	6.5	152.0	2.94	68.93
Detailed design inspection	2.5	154.5	1.13	70.07
Code	15.0	169.5	6.80	76.87
Code review	6.5	176.0	2.94	79.82
Compile	2.5	178.5	1.13	80.95
Code inspection	2.5	181.0	1.13	82.09
Unit test	1.5	182.5	.68	82.77
Build and integration	5.5	188.0	2.49	85.26
System Test	6.5	194.5	2.94	88.21
Documentation	9.0	203.5	4.08	92.29
Postmortem	17.0	220.5	7.71	100.00
Total	220.5		100.00	

TABLE 5.4 TSPi SIZE SUMMARY: FORM SUMS

Plan _____ **Assembly** _____ **Actual** X

Name Example Team B Data Date _____

Team Change Counter/System Instructor 1

Part/Level _____ Cycle _____

Product or Part Names and/or Numbers	Size Measure	Base	Deleted	Modified	Added	Reused	New and Changed	Total	Total New Reuse
SRS	Text Pages				11		11	11	
HLD	HLD Pages				18		18	18	
Main	DLD Lines				31		31	31	
	LOC				160		160	160	
LOC	DLD Lines				16		16	16	
	LOC				12		12	12	
Compare	DLD Lines				116		116	116	
	LOC				480		480	480	
Indent	DLD Lines				102		102	102	
	LOC				182		182	182	
Output	DLD Lines				52		52	52	
	LOC				127		127	127	
Totals	Text Pages				11		11	11	
	HLD Pages				18		18	18	
	DLD Lines				317		317	317	
	LOC				961		961	961	

TABLE 5.6 SAMPLE TASK PLANNING TEMPLATE: FORM TASK

Name _____ Date _____

Team Example Team B Data Instructor _____

Part/Level Change Counter/System Cycle 1

Task				Plan Hours							Plan Size/Value					Actual		
Phase	Part	Task Name	# Engineers	Team Leader	Development Manager	Planning Manager	Quality/Process Manager	Support Manager	Total Team Hours	Cumulative Hours	Size Units	Size	Week No.	Planned Value	Cumulative PV	Hours	Cumulative Hours	Week No
St	S	Launch and strategy	5	2.9	5	1.3	1.3	1.3	11.8	11.8	Pages	2	1	3.4	3.4	12.3	12.3	1
Mg	S	Mgt. and misc.	5	3.0	3.0	3.0	3.0	3.0	15.0	26.8			1	4.3	7.7	10.0	22.3	1
Pl	S	Plan - task and schedule	5	4.5	4.5	9.0	4.5	4.5	27.0	53.8			2	7.7	15.4	13.3	35.6	2
Pl	S	Generate Q&T plans	5	3.5	3.5	3.5	5.0	3.5	19.0	72.8			2	5.4	20.8	9.9	45.5	2
Mg	S	Mgt. and misc.	5	3.0	3.0	3.0	3.0	3.0	15.0	87.8			3	4.3	25.1	3.4	48.9	2
Rq	S	Review need statement	5	4.0	6.5	2.0	2.0	2.0	16.5	104.3	Pages	3	3	4.7	29.9	17	65.9	2
Rq	S	Produce SRS	5	4.0	5.5	2.0	2.0	2.0	15.5	119.8	Pages	54	3	4.4	34.3	15.6	81.4	3
Rq	S	System test plan	0						0.0	119.8			3	0.0	34.3	0.0	81.4	3
Rq	S	Req. inspection	4	2.0		2.0	2.0	2.0	8.0	127.8	Pages	5	3	2.3	36.6	2.8	84.2	3
Mg	S	Mgt. and misc.	5	2.0	2.0	2.0	2.0	2.0	10.0	137.8			4	2.9	39.5	5.9	90.1	3
Hd	S	High-level design	5	2.0	3.5	1.0	2.0	1.0	9.5	147.3	Pages	10	4	2.7	42.2	16.5	106.6	4
Hd	S	SDS	5	4.0	2.0	4.0	4.0	4.0	18.0	165.3	Pages	20	4	5.2	47.3	9.5	116.1	4
Hd	S	Integration plan	2				2.0	2.0	4.0	169.3			4	1.1	48.5	4.0	120.1	4
Hd	S	HLD inspection	5	2.5	0.3	2.5	2.5	2.5	10.3	179.5	Pages	10	5	2.9	51.4	0.0	120.1	5
Mg	S	Mgt. and misc.	5	2.0	2.0	2.0	2.0	2.0	10.0	189.5			5	2.9	54.3	21.5	141.6	5
Dd	P	Detailed design	4	3.0	3.0	3.0		3.0	12.0	201.5	Lines	137	5	3.4	57.7	40.2	181.9	5
Dr	P	DLD review	4	2.0	2.0	2.0		2.0	8.0	209.5	Lines	137	5	2.3	60.0	10.5	192.4	5
Td	S	Test development	1					1.5	1.5	211.0			5	0.4	60.5	0.0	192.4	5
DI	P	DLD inspection	5	3.0	3.0	3.0	3.0	3.0	15.0	226.0	Lines	137	5	4.3	64.8	8.9	201.3	5
Cd	P	Code	5	3.6	3.6	3.6	3.6	3.6	18.0	244.0	Lines	410	5	5.2	69.9	8.1	209.4	5
Cr	P	Code review	5	3.0	3.0	3.0	3.0	3.0	15.0	259.0	LOC	410	5	4.3	74.2	7.3	216.7	5
Cp	P	Compile	5	0.4	0.4	0.4	0.4	0.4	2.0	261.0	LOC	410	5	0.6	74.8	1.0	217.7	5
CI	P	Code inspection	5	1.0	1.0	1.0	1.0	1.0	5.0	266.0	LOC	410	5	1.4	76.2	2.7	220.4	5
UT	P	Unit test	5	1.5	1.5	1.5	1.5	1.5	7.5	273.5	LOC	410	5	2.1	78.4	18.7	239.1	5
Mg	S	Mgt. and misc.	5	4.0	4.0	4.0	4.0	4.0	20.0	293.5			6	5.7	84.1	11.2	250.3	6
St	S	Build and integration	3		2.0		2.0	2.0	6.0	299.5	LOC	410	6	1.7	85.8	1.6	251.8	6
St	S	System test	3		4.0		4.0	4.0	12.0	311.5	LOC	410	6	3.4	89.3	15.0	266.9	6
Dc	S	Documentation	2	5.0		5.0			10.0	321.5	Pages	15	6	2.9	92.1	1.6	268.4	6
Pm	S	Postmortem	5	2.0	2.0	2.0	2.0	2.0	10.0	331.5			6	2.9	95.0	2.0	270.4	6
Mg	S	Mgt. and misc.	5	5.5	3.0	3.0	3.0	3.0	17.5	349.0			6	5.0	100	9.5	280.0	6
Totals				73.4	73.3	68.6	64.8	68.8	349					100		280		

TABLE 5.7 SAMPLE SCHEDULE PLANNING TEMPLATE: FORM SCHEDULE

Name _____ Date _____

Team Example Team B Data Instructor _____

Part/Level Change Counter/System Cycle 1

		Plan			Actual			
Week No.	Date	Direct Hours	Cumulative Hours	Cumulative Planned Value	Team Hours	Cumulative Hours	Week Earned Value	Cumulative Earned Value
1	9/14	26.8	26.8	7.7	27.0	27.0	7.7	7.7
2	9/21	56.5	83.3	20.9	44.4	71.4	22.2	29.9
3	9/28	47.0	130.3	36.6	35.8	107.2	9.6	39.5
4	10/5	47.8	178.1	48.5	64.0	171.2	9.0	48.5
5	10/12	107.0	285.1	78.4	75.4	246.6	29.9	78.4
6	10/19	63.9	349.0	100.0	33.4	280.0	21.6	100.0

TABLE 5.8 TSPi QUALITY CRITERIA: STANDARD QUAL

Measure	Goal	Comments
Percent Defect Free (PDF)		
Compile	> 10%	
Unit Test	> 50%	
Integration Test	> 70%	
System Test	> 90%	
Defects/KLOC		
Total defects injected	75–150	If not PSP trained, use 100–200.
Compile	< 10	All defects flagged by compiler
Unit Test	< 5	Only major defects
Build and integration	< 0.5	Only major defects
System Test	< 0.2	Only major defects
Defect Ratios		
DLD review defects/unit test defects	> 2.0	Only major defects
Code review defects/compile defects	> 2.0	Only major defects
Development Time Ratios		
Requirements inspection/requirements time	> 0.25	Include elicitation time
HLD inspection/HLD time	> 0.5	Design work only, not studies
DLD/coding time	> 1.00	
DLD review/DLD time	> 0.5	
Code review/code time	> 0.5	
Review and Inspection Rates		
Requirements pages/hour	< 2	Single-spaced text pages
HLD pages/hour	< 5	Formatted design logic
DLD text lines/hour	< 100	Pseudocode lines equal about 3 LOC each
Code LOC/hour	< 200	Logical LOC
Defect Injection Rates		
Requirements defects/hour	0.25	Only major defects
HLD defects/hour	0.25	Only major defects
DLD defects/hour	2.0	Only design defects
Code defects/hour	4.0	Only major defects
Compile defects/hour	0.3	All defects flagged by the compiler
Unit test defects/hour	0.2	Only major defects
Defect Removal Rates		
Requirements inspection defects/hour	0.5	Only major defects
HLD inspection defects/hour	0.5	Only major defects
DLD review defects/hour	2.0	Only design defects
DLD inspection defects/hour	0.5	Only design defects
Code review defects/hour	6.0	Only major defects
Code inspection defects/hour	1.0	Only major defects
Phase Yields		
Requirements inspections	~ 70%	Not counting editorial comments
Design reviews and inspections	~ 70%	Using state analysis, trace tables
Code reviews and inspections	~ 70%	Using personal checklists
Compile	~ 50%	90+ % of syntax defects
Unit test at 5 or fewer defects/KLOC	~ 90%	For high defects/KLOC: 50–75%
Build, integration, system test – at < 1.0 defects/KLOC	~ 80%	For high defects/KLOC: 30–65%
Process Yields		
Before compile	> 75%	Assuming sound design methods
Before unit test	> 85%	Assuming logic checks in reviews
Before build and integration	> 97.5%	For small products, 1 defect max.
Before system test	> 99%	For small products, 1 defect max.

TABLE 5.9 A QUALITY PLAN EXAMPLE: FORM SUMQ

Name _____ Date _____

Team Example Team B Data Instructor _____

Part/Level Change Counter/System Cycle 1

	Plan	Actual
Summary Rates		
LOC/hour	1.17	3.43
% Reuse (% of total LOC)	0	0
% New Reuse (% of N&C LOC)	0	0
Percent Defect-Free (PDF)		
In compile	80	20
In unit test	90	20
In build and integration	95	60
In system test	99	40
Defect/page		
Requirements inspection	1.2	0
HLD inspection	0.7	0
Defects/KLOC		
DLD review	20.2	55.2
DLD inspection	6.1	15.6
Code review	65.0	27.1
Compile	15.1	28.1
Code inspection	10.6	0
Unit test	4.1	16.6
Build and integration	0.4	6.2
System test	0.1	6.2
Total development	151.2	170.7
Defect Ratios		
Code review/Compile	4.3	0.96
DLD review/Unit test	4.9	3.31
Development time ratios (%)		
Requirements inspection/Requirements	25	9
HLD inspection/HLD	37	0
DLD/code	67	497
DLD review/DLD	67	26
Code review/code	83	91
A/FR	2.23	0.89
Review rates		
DLD lines/hour	17.1	30.0
Code LOC/hour	27.3	131.1
Inspection rates		
Requirement pages/hour	0.63	3.93
HLD pages/hour	0.98	Inf.
DLD lines/hour	9.13	35.71
Code LOC/hour	82.00	362.64

TABLE 5.9 (continued)

Name _____ Date _____

Team Example Team B Data Instructor _____

Part/Level Change Counter/System Cycle 1

Defect-injection Rates (Defects/Hr.)	Plan	Actual
Requirements	0.25	0.00
HLD	0.25	0.00
DLD	0.75	2.11
Code	2.06	5.69
Compile	0.50	9.80
Unit test	0.00	0.32
Build and integration	0.00	0.00
System test	0.00	0.07
Defect-removal Rates (Defects/Hr.)		
Requirements inspection	0.70	0.00
HLD inspection	0.64	Inf.
DLD review	1.03	5.03
DLD inspection	0.17	1.69
Code review	1.78	3.55
Compile	3.10	26.47
Code inspection	0.87	0.00
Unit test	0.22	0.85
Build and integration	0.02	3.87
System test	0.00	0.40
Phase Yields		
Requirements inspection	70	Inf.
HLD inspection	70	Inf.
DLD review	70	58.9
Test development		
DLD inspection	70	40.5
Code review	70	40.6
Compile	50	56.3
Code inspection	70	0.0
Unit test	90	59.3
Build and integration	80	54.5
System test	80	100.0
Process Yields		
% before compile	81.3	74.1
% before unit test	97.0	86.6
% before build and integration	99.7	93.3
% before system test	99.9	96.9
% before system delivery		

TABLE 5.10 SAMPLE TSPi PLAN SUMMARY: FORM SUMP

Name _____ Date _____

Team Example Team B Data Instructor _____

Part/Level Change Counter/System Cycle 1

Product Size	**Plan**	**Actual**
Requirements pages (SRS)	5	11
Other text pages		
High-level design pages (SDS)	10	18
Detailed design lines	137	316
Base LOC (B) (measured)		
Deleted LOC (D)		
Modified LOC (M)	(Estimated)	(Counted)
Added LOC (A)	(Estimated) 410	(Counted) 961
Reused LOC (R)	(N–M)	(T–B+D–R)
Total New and Changed LOC (N)	(Estimated) 410	(Counted) 961
Total LOC (T)	(Estimated) 410	(A+M) 961
Total New Reuse LOC	(N+B–M–D+R)	(Measured)
Estimated Object LOC (E)		
Upper Prediction Interval (70%)		
Lower Prediction Interval (70%)		

Time in Phase (hours)	**Plan**	**Actual**	**Actual %**
Management and miscellaneous	87.5	61.5	21.95
Launch	11.8	12.3	4.39
Strategy and planning	46.0	23.2	8.29
Requirements	32.0	32.6	11.64
System test plan			
Requirements inspection	8.0	2.8	1.00
High-level design	27.5	26.0	9.29
Integration test plan	4.0	4.0	1.43
High-level design inspection	10.2		
Implementation planning			
Detailed design	12.0	40.3	14.39
Detailed design review	8.0	10.6	3.79
Test development	1.5		
Detailed design inspection	15.0	8.9	3.18
Code	18.0	8.0	2.86
Code review	15.0	7.3	2.61
Compile	2.0	1.0	0.36
Code inspection	5.0	2.7	0.96
Unit test	7.5	18.7	6.68
Build and integration	6.0	1.5	0.54
System test	12.0	15.0	5.36
Documentation	10.0	1.6	0.57

TABLE 5.10 (continued)

Name _____ Date _____

Team Example Team B Data Instructor _____

Part/Level Change Counter/System Cycle 1

Time in Phase (hours)	**Plan**	**Actual**	**Actual %**
Postmortem	10.0	2.0	0.71
Total	349.0	280.0	
Total Time UPI (70%)			
Total Time LPI (70%)			
Defects Injected	**Plan**	**Actual**	**Actual %**
Strategy and planning			
Requirements	8		
System test plan			
Requirements inspection			
High-level design	7		
Integration test plan			
High-level design inspection			
Detailed design	9	85	51.81
Detailed design review		9	5.49
Test development			
Detailed design inspection			
Code	37	46	28.04
Code review		7	4.29
Compile	1	10	6.10
Code inspection			
Unit test		6	3.66
Build and integration			
System test		1	0.61
Total Development	62	164	
Defects Removed	**Plan**	**Actual**	**Actual %**
Strategy and planning			
Requirements			
System test plan			
Requirements inspection	5.60		
High-level design			
Integration test plan			
High-level design inspection	6.58		
Detailed design		4	2.44
Detailed design review	8.27	53	32.31
Test development			
Detailed design inspection	2.48	15	9.15
Code		11	6.71
Code review	26.65	26	15.85
Compile	6.21	27	16.46
Code inspection	4.35		
Unit test	1.68	16	9.76
Build and integration	0.15	6	3.66
System test	0.03	6	3.66
Total Development	62.00	164	

TABLE 7.4 SAMPLE STRAT FORM WITH COMPONENT ALLOCATION

Name _____ Date _____

Team _____ Instructor _____

Part/Level _____ Cycle _____

Reference	Functions	Cycle LOC			Cycle Hours		
		1	2	3	1	2	3
	Diff						
1.1	Compare modified program with prior version		A				
1.2	Identify added and deleted LOC		A				
2.3	Compare for added and deleted LOC		A				
4.1	Label each change with change number (P)		A				
	Counter						
1.3	Count added and deleted LOC			B			
1.4	Count total LOC in modified program			B			
2.1	Count text lines with coding standard			B			
2.4	Count changed lines as added and deleted		B				
3.3	Count new programs as version 0		B				
4.5s2	Retain LOC count when rolling lines (P)			B			
	Listing						
1.5	Attach line labels		C				
1.6	Provide change label header	C					
1.7	Maintain change record history in header		C				
1.8	Retain prior change history			C/D			
3.1	Comment header section	D					
3.2	List prior program modifications in order		D				
3.4	Provide change information in label	D					
3.5	Provide change data in label	D					
3.6	For defect fixes, note fix number in label	C/D					
3.7	For enhancements, note project data in label	C/D					
4.1	Label each change with change number (P)		D				
4.2	Retain deleted line in comment			C			
4.3	Note previously deleted and added lines			C			
4.5s1	Where lines too long, roll to next line		C				
4.5s2	Retain LOC count when rolling lines (P)			C/D			
4.6	Retain original program indenting			C/D			
4.7	Indent rolled lines to middle of listing		D				
	File						
1.9	New program source file with change info.	E					
	Report						
1.12	Print program listing with change labels	F					
1.13	Print line numbers on listing		F	F			
1.14	Print program change report			F			
Totals							