

Capability Maturity Model Integrationsm



CMMIsm Cost Model (1st Ever)

David F. Rico

sm Capability Maturity Model Integration and CMMI are service marks of Carnegie Mellon University.

Overview



Overview



- **LEVEL 1 - INITIAL**
 - n/a
- **LEVEL 2 - MANAGED**
 - Requirements Management
 - Project Planning
 - Project Monitoring and Control
 - Supplier Agreement Management
 - Measurement and Analysis
 - Process and Product Quality Assurance
 - Configuration Management
- **LEVEL 3 - DEFINED**
 - Requirements Development
 - Technical Solution
 - Product Integration
 - Verification
 - Validation
- **LEVEL 3 – DEFINED (continued)**
 - Organizational Process Focus
 - Organizational Process Definition
 - Organizational Training
 - Integrated Project Management for IPPD
 - Risk Management
 - Integrated Teaming
 - Integrated Supplier Management
 - Decision Analysis and Resolution
 - Organizational Environment for Integration
- **LEVEL 4 – QUANTITATIVELY MANAGED**
 - Organizational Process Performance
 - Quantitative Project Management
- **LEVEL 5 - OPTIMIZING**
 - Organizational Innovation and Deployment
 - Causal Analysis and Resolution

CMMI Cost Model



CMMI Specific Practices

CMMIsm Policies & Procedures (Specific Practices)

Process Areas	Specific Practices	Slow				Medium				Fast				Average			
		Hours	Days	Weeks	Months	Hours	Days	Weeks	Months	Hours	Days	Weeks	Months	Hours	Days	Weeks	Months
CMMI	189	12,096	1,512	302.4	69.8	6,048	756	151.2	34.9	3,024	378	75.6	17.4	7,056	882	176.4	40.7
Maturity Level 2 - Managed	55	3,520	440	88.0	20.3	1,760	220	44.0	10.2	880	110	22.0	5.1	2,053	257	51.3	11.8
Requirements Management	5	320	40	8.0	1.8	160	20	4.0	0.9	80	10	2.0	0.5	187	23	4.7	1.1
Project Planning	14	896	112	22.4	5.2	448	56	11.2	2.6	224	28	5.6	1.3	523	65	13.1	3.0
Project Monitoring and Control	10	640	80	16.0	3.7	320	40	8.0	1.8	160	20	4.0	0.9	373	47	9.3	2.2
Supplier Agreement Management	7	448	56	11.2	2.6	224	28	5.6	1.3	112	14	2.8	0.6	261	33	6.5	1.5
Measurement and Analysis	8	512	64	12.8	3.0	256	32	6.4	1.5	128	16	3.2	0.7	299	37	7.5	1.7
Process and Product Quality Assurance	4	256	32	6.4	1.5	128	16	3.2	0.7	64	8	1.6	0.4	149	19	3.7	0.9
Configuration Management	7	448	56	11.2	2.6	224	28	5.6	1.3	112	14	2.8	0.6	261	33	6.5	1.5
Maturity Level 3 - Defined	109	6,976	872	174.4	40.2	3,488	436	87.2	20.1	1,744	218	43.6	10.1	4,069	509	101.7	23.5
Requirements Development	12	768	96	19.2	4.4	384	48	9.6	2.2	192	24	4.8	1.1	448	56	11.2	2.6
Technical Solution	11	704	88	17.6	4.1	352	44	8.8	2.0	176	22	4.4	1.0	411	51	10.3	2.4
Product Integration	9	576	72	14.4	3.3	288	36	7.2	1.7	144	18	3.6	0.8	336	42	8.4	1.9
Verification	8	512	64	12.8	3.0	256	32	6.4	1.5	128	16	3.2	0.7	299	37	7.5	1.7
Validation	5	320	40	8.0	1.8	160	20	4.0	0.9	80	10	2.0	0.5	187	23	4.7	1.1
Organizational Process Focus	7	448	56	11.2	2.6	224	28	5.6	1.3	112	14	2.8	0.6	261	33	6.5	1.5
Organizational Process Definition	5	320	40	8.0	1.8	160	20	4.0	0.9	80	10	2.0	0.5	187	23	4.7	1.1
Organizational Training	7	448	56	11.2	2.6	224	28	5.6	1.3	112	14	2.8	0.6	261	33	6.5	1.5
Integrated Project Management for IPPD	13	832	104	20.8	4.8	416	52	10.4	2.4	208	26	5.2	1.2	485	61	12.1	2.8
Risk Management	7	448	56	11.2	2.6	224	28	5.6	1.3	112	14	2.8	0.6	261	33	6.5	1.5
Integrated Teaming	8	512	64	12.8	3.0	256	32	6.4	1.5	128	16	3.2	0.7	299	37	7.5	1.7
Integrated Supplier Management	5	320	40	8.0	1.8	160	20	4.0	0.9	80	10	2.0	0.5	187	23	4.7	1.1
Decision Analysis and Resolution	6	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Organizational Environment for Integration	6	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Maturity Level 4 - Quantitatively Managed	13	832	104	20.8	4.8	416	52	10.4	2.4	208	26	5.2	1.2	485	61	12.1	2.8
Organizational Process Performance	5	320	40	8.0	1.8	160	20	4.0	0.9	80	10	2.0	0.5	187	23	4.7	1.1
Quantitative Project Management	8	512	64	12.8	3.0	256	32	6.4	1.5	128	16	3.2	0.7	299	37	7.5	1.7
Maturity Level 5 - Optimizing	12	768	96	19.2	4.4	384	48	9.6	2.2	192	24	4.8	1.1	448	56	11.2	2.6
Organizational Innovation and Deployment	7	448	56	11.2	2.6	224	28	5.6	1.3	112	14	2.8	0.6	261	33	6.5	1.5
Causal Analysis and Resolution	5	320	40	8.0	1.8	160	20	4.0	0.9	80	10	2.0	0.5	187	23	4.7	1.1

CMMI Generic Practices

CMMIsm Policies & Procedures (Generic Practices)

Process Areas	Generic Practices	Slow				Medium				Fast				Average			
		Hours	Days	Weeks	Months	Hours	Days	Weeks	Months	Hours	Days	Weeks	Months	Hours	Days	Weeks	Months
CMMI	300	9,600	1,200	240.0	55.4	4,800	600	120.0	27.7	2,400	300	60.0	13.8	5,600	700	140.0	32.3
Maturity Level 2 - Managed	84	2,688	336	67.2	15.5	1,344	168	33.6	7.8	672	84	16.8	3.9	1,568	196	39.2	9.0
Requirements Management	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Project Planning	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Project Monitoring and Control	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Supplier Agreement Management	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Measurement and Analysis	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Process and Product Quality Assurance	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Configuration Management	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Maturity Level 3 - Defined	168	5,376	672	134.4	31.0	2,688	336	67.2	15.5	1,344	168	33.6	7.8	3,136	392	78.4	18.1
Requirements Development	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Technical Solution	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Product Integration	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Verification	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Validation	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Organizational Process Focus	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Organizational Process Definition	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Organizational Training	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Integrated Project Management for IPPD	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Risk Management	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Integrated Teaming	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Integrated Supplier Management	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Decision Analysis and Resolution	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Organizational Environment for Integration	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Maturity Level 4 - Quantitatively Managed	24	768	96	19.2	4.4	384	48	9.6	2.2	192	24	4.8	1.1	448	56	11.2	2.6
Organizational Process Performance	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Quantitative Project Management	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Maturity Level 5 - Optimizing	24	768	96	19.2	4.4	384	48	9.6	2.2	192	24	4.8	1.1	448	56	11.2	2.6
Organizational Innovation and Deployment	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3
Causal Analysis and Resolution	12	384	48	9.6	2.2	192	24	4.8	1.1	96	12	2.4	0.6	224	28	5.6	1.3

CMMI Evidence-of-Use

CMMI Evidence-of-Use (7 Projects)

Process Areas	Work Products	Slow				Medium				Fast				Average			
		Hours	Days	Weeks	Months	Hours	Days	Weeks	Months	Hours	Days	Weeks	Months	Hours	Days	Weeks	Months
CMMI	478	107,072	13,384	2,676.8	617.7	53,536	6,692	1,338.4	308.9	26,768	3,346	669.2	154.4	62,459	7,807	1,561.5	360.3
Maturity Level 2 - Managed	138	30,912	3,864	772.8	178.3	15,456	1,932	386.4	89.2	7,728	966	193.2	44.6	18,032	2,254	450.8	104.0
Requirements Management	13	2,912	364	72.8	16.8	1,456	182	36.4	8.4	728	91	18.2	4.2	1,699	212	42.5	9.8
Project Planning	46	10,304	1,288	257.6	59.4	5,152	644	128.8	29.7	2,576	322	64.4	14.9	6,011	751	150.3	34.7
Project Monitoring and Control	11	2,464	308	61.6	14.2	1,232	154	30.8	7.1	616	77	15.4	3.6	1,437	180	35.9	8.3
Supplier Agreement Management	26	5,824	728	145.6	33.6	2,912	364	72.8	16.8	1,456	182	36.4	8.4	3,397	425	84.9	19.6
Measurement and Analysis	12	2,688	336	67.2	15.5	1,344	168	33.6	7.8	672	84	16.8	3.9	1,568	196	39.2	9.0
Process and Product Quality Assurance	14	3,136	392	78.4	18.1	1,568	196	39.2	9.0	784	98	19.6	4.5	1,829	229	45.7	10.6
Configuration Management	16	3,584	448	89.6	20.7	1,792	224	44.8	10.3	896	112	22.4	5.2	2,091	261	52.3	12.1
Maturity Level 3 - Defined	291	65,184	8,148	1,629.6	376.1	32,592	4,074	814.8	188.0	16,296	2,037	407.4	94.0	38,024	4,753	950.6	219.4
Requirements Development	29	6,496	812	162.4	37.5	3,248	406	81.2	18.7	1,624	203	40.6	9.4	3,789	474	94.7	21.9
Technical Solution	26	5,824	728	145.6	33.6	2,912	364	72.8	16.8	1,456	182	36.4	8.4	3,397	425	84.9	19.6
Product Integration	27	6,048	756	151.2	34.9	3,024	378	75.6	17.4	1,512	189	37.8	8.7	3,528	441	88.2	20.4
Verification	24	5,376	672	134.4	31.0	2,688	336	67.2	15.5	1,344	168	33.6	7.8	3,136	392	78.4	18.1
Validation	16	3,584	448	89.6	20.7	1,792	224	44.8	10.3	896	112	22.4	5.2	2,091	261	52.3	12.1
Organizational Process Focus	20	4,480	560	112.0	25.8	2,240	280	56.0	12.9	1,120	140	28.0	6.5	2,613	327	65.3	15.1
Organizational Process Definition	11	2,464	308	61.6	14.2	1,232	154	30.8	7.1	616	77	15.4	3.6	1,437	180	35.9	8.3
Organizational Training	13	2,912	364	72.8	16.8	1,456	182	36.4	8.4	728	91	18.2	4.2	1,699	212	42.5	9.8
Integrated Project Management for IPPD	46	10,304	1,288	257.6	59.4	5,152	644	128.8	29.7	2,576	322	64.4	14.9	6,011	751	150.3	34.7
Risk Management	16	3,584	448	89.6	20.7	1,792	224	44.8	10.3	896	112	22.4	5.2	2,091	261	52.3	12.1
Integrated Teaming	25	5,600	700	140.0	32.3	2,800	350	70.0	16.2	1,400	175	35.0	8.1	3,267	408	81.7	18.8
Integrated Supplier Management	16	3,584	448	89.6	20.7	1,792	224	44.8	10.3	896	112	22.4	5.2	2,091	261	52.3	12.1
Decision Analysis and Resolution	7	1,568	196	39.2	9.0	784	98	19.6	4.5	392	49	9.8	2.3	915	114	22.9	5.3
Organizational Environment for Integration	15	3,360	420	84.0	19.4	1,680	210	42.0	9.7	840	105	21.0	4.8	1,960	245	49.0	11.3
Maturity Level 4 - Quantitatively Managed	28	6,272	784	156.8	36.2	3,136	392	78.4	18.1	1,568	196	39.2	9.0	3,659	457	91.5	21.1
Organizational Process Performance	5	1,120	140	28.0	6.5	560	70	14.0	3.2	280	35	7.0	1.6	653	82	16.3	3.8
Quantitative Project Management	23	5,152	644	128.8	29.7	2,576	322	64.4	14.9	1,288	161	32.2	7.4	3,005	376	75.1	17.3
Maturity Level 5 - Optimizing	21	4,704	588	117.6	27.1	2,352	294	58.8	13.6	1,176	147	29.4	6.8	2,744	343	68.6	15.8
Organizational Innovation and Deployment	12	2,688	336	67.2	15.5	1,344	168	33.6	7.8	672	84	16.8	3.9	1,568	196	39.2	9.0
Causal Analysis and Resolution	9	2,016	252	50.4	11.6	1,008	126	25.2	5.8	504	63	12.6	2.9	1,176	147	29.4	6.8

CMMI Cost Model (Total)

CMMI Policies & Procedures/Evidence-of-Use (7 Projects)

Process Areas	SP, GP, & WP	Slow				Medium				Fast				Average			
		Hours	Days	Weeks	Months	Hours	Days	Weeks	Months	Hours	Days	Weeks	Months	Hours	Days	Weeks	Months
CMMI	967	134,112	16,764	3,352.8	773.7	67,056	8,382	1,676.4	386.9	33,528	4,191	838.2	193.4	78,232	9,779	1,955.8	451.3
Maturity Level 2 - Managed	277	37,120	4,640	928.0	214.2	18,560	2,320	464.0	107.1	9,280	1,160	232.0	53.5	21,653	2,707	541.3	124.9
Requirements Management	30	3,616	452	90.4	20.9	1,808	226	45.2	10.4	904	113	22.6	5.2	2,109	264	52.7	12.2
Project Planning	72	11,584	1,448	289.6	66.8	5,792	724	144.8	33.4	2,896	362	72.4	16.7	6,757	845	168.9	39.0
Project Monitoring and Control	33	3,488	436	87.2	20.1	1,744	218	43.6	10.1	872	109	21.8	5.0	2,035	254	50.9	11.7
Supplier Agreement Management	45	6,656	832	166.4	38.4	3,328	416	83.2	19.2	1,664	208	41.6	9.6	3,883	485	97.1	22.4
Measurement and Analysis	32	3,584	448	89.6	20.7	1,792	224	44.8	10.3	896	112	22.4	5.2	2,091	261	52.3	12.1
Process and Product Quality Assurance	30	3,776	472	94.4	21.8	1,888	236	47.2	10.9	944	118	23.6	5.4	2,203	275	55.1	12.7
Configuration Management	35	4,416	552	110.4	25.5	2,208	276	55.2	12.7	1,104	138	27.6	6.4	2,576	322	64.4	14.9
Maturity Level 3 - Defined	568	77,536	9,692	1,938.4	447.3	38,768	4,846	969.2	223.7	19,384	2,423	484.6	111.8	45,229	5,654	1,130.7	260.9
Requirements Development	53	7,648	956	191.2	44.1	3,824	478	95.6	22.1	1,912	239	47.8	11.0	4,461	558	111.5	25.7
Technical Solution	49	6,912	864	172.8	39.9	3,456	432	86.4	19.9	1,728	216	43.2	10.0	4,032	504	100.8	23.3
Product Integration	48	7,008	876	175.2	40.4	3,504	438	87.6	20.2	1,752	219	43.8	10.1	4,088	511	102.2	23.6
Verification	44	6,272	784	156.8	36.2	3,136	392	78.4	18.1	1,568	196	39.2	9.0	3,659	457	91.5	21.1
Validation	33	4,288	536	107.2	24.7	2,144	268	53.6	12.4	1,072	134	26.8	6.2	2,501	313	62.5	14.4
Organizational Process Focus	39	5,312	664	132.8	30.6	2,656	332	66.4	15.3	1,328	166	33.2	7.7	3,099	387	77.5	17.9
Organizational Process Definition	28	3,168	396	79.2	18.3	1,584	198	39.6	9.1	792	99	19.8	4.6	1,848	231	46.2	10.7
Organizational Training	32	3,744	468	93.6	21.6	1,872	234	46.8	10.8	936	117	23.4	5.4	2,184	273	54.6	12.6
Integrated Project Management for IPPD	71	11,520	1,440	288.0	66.5	5,760	720	144.0	33.2	2,880	360	72.0	16.6	6,720	840	168.0	38.8
Risk Management	35	4,416	552	110.4	25.5	2,208	276	55.2	12.7	1,104	138	27.6	6.4	2,576	322	64.4	14.9
Integrated Teaming	45	6,496	812	162.4	37.5	3,248	406	81.2	18.7	1,624	203	40.6	9.4	3,789	474	94.7	21.9
Integrated Supplier Management	33	4,288	536	107.2	24.7	2,144	268	53.6	12.4	1,072	134	26.8	6.2	2,501	313	62.5	14.4
Decision Analysis and Resolution	25	2,336	292	58.4	13.5	1,168	146	29.2	6.7	584	73	14.6	3.4	1,363	170	34.1	7.9
Organizational Environment for Integration	33	4,128	516	103.2	23.8	2,064	258	51.6	11.9	1,032	129	25.8	6.0	2,408	301	60.2	13.9
Maturity Level 4 - Quantitatively Managed	65	9,696	1,212	242.4	55.9	4,848	606	121.2	28.0	2,424	303	60.6	14.0	5,656	707	141.4	32.6
Organizational Process Performance	22	7,872	984	196.8	45.4	3,936	492	98.4	22.7	1,968	246	49.2	11.4	4,592	574	114.8	26.5
Quantitative Project Management	43	1,824	228	45.6	10.5	912	114	22.8	5.3	456	57	11.4	2.6	1,064	133	26.6	6.1
Maturity Level 5 - Optimizing	57	9,760	1,220	244.0	56.3	4,880	610	122.0	28.2	2,440	305	61.0	14.1	5,693	712	142.3	32.8
Organizational Innovation and Deployment	31	6,240	780	156.0	36.0	3,120	390	78.0	18.0	1,560	195	39.0	9.0	3,640	455	91.0	21.0
Causal Analysis and Resolution	26	3,520	440	88.0	20.3	1,760	220	44.0	10.2	880	110	22.0	5.1	2,053	257	51.3	11.8

Maturity Level 2



Managed

Requirements Management



- SG 1 Manage Requirements
 - *SP 1.1 Obtain an Understanding of Requirements*
 - *SP 1.2 Obtain Commitment to Requirements*
 - *SP 1.3 Manage Requirements Changes*
 - *SP 1.4 Maintain Bidirectional Traceability of Requirements*
 - *SP 1.5 Identify Inconsistencies between Project Work and Requirements*

Project Planning



- SG 1 Establish Estimates
 - *SP 1.1 Estimate the Scope of the Project*
 - *SP 1.2 Establish Estimates of Work Product and Task Attributes*
 - *SP 1.3 Define Project Life Cycle*
 - *SP 1.4 Determine Estimates of Effort and Cost*
- SG 2 Develop a Project Plan
 - *SP 2.1 Establish the Budget and Schedule*
 - *SP 2.2 Identify Project Risks*
 - *SP 2.3 Plan for Data Management*
 - *SP 2.4 Plan for Project Resources*
 - *SP 2.5 Plan for Needed Knowledge and Skills*
 - *SP 2.6 Plan Stakeholder Involvement*
 - *SP 2.7 Establish the Project Plan*
- SG 3 Obtain Commitment to the Plan
 - *SP 3.1 Review Plans that Affect the Project*
 - *SP 3.2 Reconcile Work and Resource Levels*
 - *SP 3.3 Obtain Plan Commitment*

Project Monitoring and Control



- SG 1 Monitor Project Against Plan
 - *SP 1.1 Monitor Project Planning Parameters*
 - *SP 1.2 Monitor Commitments*
 - *SP 1.3 Monitor Project Risks*
 - *SP 1.4 Monitor Data Management*
 - *SP 1.5 Monitor Stakeholder Involvement*
 - *SP 1.6 Conduct Progress Reviews*
 - *SP 1.7 Conduct Milestone Reviews*
- SG 2 Manage Corrective Action to Closure
 - *SP 2.1 Analyze Issues*
 - *SP 2.2 Take Corrective Action*
 - *SP 2.3 Manage Corrective Action*

Supplier Agreement Management



- SG 1 Establish Supplier Agreements
 - *SP 1.1 Determine Acquisition Type*
 - *SP 1.2 Select Suppliers*
 - *SP 1.3 Establish Supplier Agreements*
- SG 2 Satisfy Supplier Agreements
 - *SP 2.1 Review COTS Products*
 - *SP 2.2 Execute Supplier Agreement*
 - *SP 2.3 Accept the Acquired Product*
 - *SP 2.4 Transition Products*

Measurement and Analysis




- SG 1 Align Measurement and Analysis Activities
 - *SP 1.1 Establish Measurement Objectives*
 - *SP 1.2 Specify Measures*
 - *SP 1.3 Specify Data Collection and Storage Procedures*
 - *SP 1.4 Specify Analysis Procedures*
- SG 2 Provide Measurement Results
 - *SP 2.1 Collect Measurement Data*
 - *SP 2.2 Analyze Measurement Data*
 - *SP 2.3 Store Data and Results*
 - *SP 2.4 Communicate Results*

Process and Product Quality Assurance



- SG 1 Objectively Evaluate Processes and Work Products
 - *SP 1.1 Objectively Evaluate Processes*
 - *SP 1.2 Objectively Evaluate Work Products and Services*
- SG 2 Provide Objective Insight
 - *SP 2.1 Communicate and Ensure Resolution of Noncompliance Issues*
 - *SP 2.2 Establish Records*

Configuration Management



- SG 1 Establish Baselines
 - *SP 1.1 Identify Configuration Items*
 - *SP 1.2 Establish a Configuration Management System*
 - *SP 1.3 Create or Release Baselines*
- SG 2 Track and Control Changes
 - *SP 2.1 Track Change Requests*
 - *SP 2.2 Control Configuration Items*
- SG 3 Establish Integrity
 - *SP 3.1 Establish Configuration Management Records*
 - *SP 3.2 Perform Configuration Audits*

Maturity Level 3



Defined

Requirements Development



- SG 1 Develop Customer Requirements
 - *SP 1.1-1 Collect Stakeholder Needs*
 - *SP 1.1 Elicit Needs*
 - *SP 1.2 Develop the Customer Requirements*
- SG 2 Develop Product Requirements
 - *SP 2.1 Establish Product and Product-Component Requirements*
 - *SP 2.2 Allocate Product Component Requirements*
 - *SP 2.3 Identify Interface Requirements*
- SG 3 Analyze and Validate Requirements
 - *SP 3.1 Establish Operational Concepts and Scenarios*
 - *SP 3.2 Establish a Definition of Required Functionality*
 - *SP 3.3 Analyze Requirements*
 - *SP 3.4 Analyze Requirements to Achieve Balance*
 - *SP 3.5-1 Validate Requirements*
 - *SP 3.5 Validate Requirements with Comprehensive Methods*

Technical Solution



- SG 1 Select Product-Component Solutions
 - *SP 1.1-1 Develop Alternative Solutions and Selection Criteria*
 - *SP 1.1 Develop Detailed Alternative Solutions and Selection Criteria*
 - *SP 1.2 Evolve Operational Concepts and Scenarios*
 - *SP 1.3 Select Product-Component Solutions*
- SG 2 Develop the Design
 - *SP 2.1 Design the Product or Product Component*
 - *SP 2.2 Establish a Technical Data Package*
 - *SP 2.3-1 Establish Interface Descriptions*
 - *SP 2.3 Design Interfaces Using Criteria*
 - *SP 2.4 Perform Make, Buy, or Reuse Analyses*
- SG 3 Implement the Product Design
 - *SP 3.1 Implement the Design*
 - *SP 3.2 Develop Product Support Documentation*

Product Integration



- SG 1 Prepare for Product Integration
 - *SP 1.1 Determine Integration Sequence*
 - *SP 1.2 Establish the Product Integration Environment*
 - *SP 1.3 Establish Product Integration Procedures and Criteria*
- SG 2 Ensure Interface Compatibility
 - *SP 2.1 Review Interface Descriptions for Completeness*
 - *SP 2.2 Manage Interfaces*
- SG 3 Assemble Product Components and Deliver the Product
 - *SP 3.1 Confirm Readiness of Product Components for Integration*
 - *SP 3.2 Assemble Product Components*
 - *SP 3.3 Evaluate Assembled Product Components*
 - *SP 3.4 Package and Deliver the Product or Product Component*

Verification



- SG 1 Prepare for Verification
 - *SP 1.1 Select Work Products for Verification*
 - *SP 1.2 Establish the Verification Environment*
 - *SP 1.3 Establish Verification Procedures and Criteria*
- SG 2 Perform Peer Reviews
 - *SP 2.1 Prepare for Peer Reviews*
 - *SP 2.2 Conduct Peer Reviews*
 - *SP 2.3 Analyze Peer Review Data*
- SG 3 Verify Selected Work Products
 - *SP 3.1 Perform Verification*
 - *SP 3.2 Analyze Verification Results and Identify Corrective Action*

Validation



- SG 1 Prepare for Validation
 - *SP 1.1 Select Products for Validation*
 - *SP 1.2 Establish the Validation Environment*
 - *SP 1.3 Establish Validation Procedures and Criteria*
- SG 2 Validate Product or Product Components
 - *SP 2.1 Perform Validation*
 - *SP 2.2 Analyze Validation Results*

Organizational Process Focus



- SG 1 Determine Process-Improvement Opportunities
 - *SP 1.1 Establish Organizational Process Needs*
 - *SP 1.2 Appraise the Organization's Processes*
 - *SP 1.3 Identify the Organization's Process Improvements*
- SG 2 Plan and Implement Process-Improvement Activities
 - *SP 2.1 Establish Process Action Plans*
 - *SP 2.2 Implement Process Action Plans*
 - *SP 2.3 Deploy Organizational Process Assets*
 - *SP 2.4 Incorporate Process-Related Experiences into the Organizational Process Assets*

Organizational Process Definition



- SG 1 Create Organizational Process Assets
 - *SP 1.1 Establish Standard Processes*
 - *SP 1.2 Establish Life Cycle Model Descriptions*
 - *SP 1.3 Establish Tailoring Criteria and Guidelines*
 - *SP 1.4 Establish the Organization's Measurement Repository*
 - *SP 1.5 Establish the Organization's Process Asset Library*

Organizational Training



- SG 1 Establish an Organizational Training Capability
 - *SP 1.1 Establish the Strategic Training Needs*
 - *SP 1.2 Determine Which Training Needs Are the Responsibility of the Organization*
 - *SP 1.3 Establish Organizational Training Tactical Plan*
 - *SP 1.4 Establish Training Capability*
- SG 2 Provide Necessary Training
 - *SP 2.1 Deliver Training*
 - *SP 2.2 Establish Training Records*
 - *SP 2.3 Assess Training Effectiveness*

Integrated Project Management for IPPD



- SG 1 Use the Project's Defined Process
 - *SP 1.1 Establish the Project's Defined Process*
 - *SP 1.2 Use Organizational Process Assets for Planning Project Activities*
 - *SP 1.3 Integrate Plans*
 - *SP 1.4 Manage the Project Using the Integrated Plans*
 - *SP 1.5 Contribute to the Organizational Process Assets*
- SG 2 Coordinate and Collaborate with Relevant Stakeholders
 - *SP 2.1 Manage Stakeholder Involvement*
 - *SP 2.2 Manage Dependencies*
 - *SP 2.3 Resolve Coordination Issues*
- SG 3 Use the Project's Shared Vision for IPPD
 - *SP 3.1 Define Project's Shared-Vision Context*
 - *SP 3.2 Establish the Project's Shared Vision*
- SG 4 Organize Integrated Teams for IPPD
 - *SP 4.1 Determine Integrated Team Structure for the Project*
 - *SP 4.2 Develop a Preliminary Distribution of Requirements to Integrated Teams*
 - *SP 4.3 Establish Integrated Teams*

Risk Management



- SG 1 Prepare for Risk Management
 - *SP 1.1 Determine Risk Sources and Categories*
 - *SP 1.2 Define Risk Parameters*
 - *SP 1.3 Establish a Risk Management Strategy*
- SG 2 Identify and Analyze Risks
 - *SP 2.1 Identify Risks*
 - *SP 2.2 Evaluate, Categorize, and Prioritize Risks*
- SG 3 Mitigate Risks
 - *SP 3.1 Develop Risk Mitigation Plans*
 - *SP 3.2 Implement Risk Mitigation Plans*

Integrated Teaming



- SG 1 Establish Team Composition
 - *SP 1.1 Identify Team Tasks*
 - *SP 1.2 Identify Needed Knowledge and Skills*
 - *SP 1.3 Assign Appropriate Team Members*
- SG 2 Govern Team Operation
 - *SP 2.1 Establish a Shared Vision*
 - *SP 2.2 Establish a Team Charter*
 - *SP 2.3 Define Roles and Responsibilities*
 - *SP 2.4 Establish Operating Procedures*
 - *SP 2.5 Collaborate Among Interfacing Teams*

Integrated Supplier Management



- SG 1 Analyze and Select Sources of Products
 - *SP 1.1 Analyze Potential Sources of Products*
 - *SP 1.2 Evaluate and Determine Sources of Products*
- SG 2 Coordinate Work with Suppliers
 - *SP 2.1 Monitor Selected Supplier Work Products*
 - *SP 2.2 Evaluate Selected Supplier Work Products*
 - *SP 2.3 Revise the Supplier Agreement or Relationship*

Decision Analysis and Resolution



- SG 1 Evaluate Alternatives
 - *SP 1.1 Establish Guidelines for Decision Analysis*
 - *SP 1.2 Establish Evaluation Criteria*
 - *SP 1.3 Identify Alternative Solutions*
 - *SP 1.4 Select Evaluation Methods*
 - *SP 1.5 Evaluate Alternatives*
 - *SP 1.6 Select Solutions*

Organizational Environment for Integration



- SG 1 Provide IPPD Infrastructure
 - *SP 1.1 Establish the Organization's Shared Vision*
 - *SP 1.2 Establish an Integrated Work Environment*
 - *SP 1.3 Identify IPPD-Unique Skill Requirements*
- SG 2 Manage People for Integration
 - *SP 2.1 Establish Leadership Mechanisms*
 - *SP 2.2 Establish Incentives for Integration*
 - *SP 2.3 Establish Mechanisms to Balance Team and Home Organization Responsibilities*

Maturity Level 4



Quantitatively Managed

Organizational Process Performance



- SG 1 Establish Performance Baselines and Models
 - *SP 1.1 Select Processes*
 - *SP 1.2 Establish Process Performance Measures*
 - *SP 1.3 Establish Quality and Process-Performance Objectives*
 - *SP 1.4 Establish Process Performance Baselines*
 - *SP 1.5 Establish Process Performance Models*

Quantitative Project Management



- SG 1 Quantitatively Manage the Project
 - *SP 1.1 Establish the Project's Objectives*
 - *SP 1.2 Compose the Defined Process*
 - *SP 1.3 Select the Subprocesses That Will Be Statistically Managed*
 - *SP 1.4 Manage Project Performance*
- SG 2 Statistically Manage Subprocess Performance
 - *SP 2.1 Select Measures and Analytic Techniques*
 - *SP 2.2 Apply Statistical Methods to Understand Variation*
 - *SP 2.3 Monitor Performance of the Selected Subprocesses*
 - *SP 2.4 Record Statistical Management Data*

Maturity Level 5



Optimizing

Organizational Innovation and Deployment



- SG 1 Select Improvements
 - *SP 1.1 Collect and Analyze Improvement Proposals*
 - *SP 1.2 Identify and Analyze Innovations*
 - *SP 1.3 Pilot Improvements*
 - *SP 1.4 Select Improvements for Deployment*
- SG 2 Deploy Improvements
 - *SP 2.1 Plan the Deployment*
 - *SP 2.2 Manage the Deployment*
 - *SP 2.3 Measure Improvement Effects*

Causal Analysis and Resolution



- SG 1 Determine Causes of Defects
 - *SP 1.1 Select Defect Data for Analysis*
 - *SP 1.2 Analyze Causes*
- SG 2 Address Causes of Defects
 - *SP 2.1 Implement the Action Proposals*
 - *SP 2.2 Evaluate the Effect of Changes*
 - *SP 2.3 Record Data*