



Project Monitoring and Control; RLCA Package and ARB Guidelines

CS 577b Spring 2001 Lecture
Barry Boehm



Outline

- **Overall structure of Life Cycle Plan (LCP) and subsidiary information**
- **Relation to CMMI Monitoring and Control activities**
- **RLCA Package and ARB Guidelines**
- **Example Large project Monitoring and Control approach**



MBASE Life Cycle Plan Guidelines

- 1. Purpose and Assumptions (why? whereas?)**
- 2. Milestones and Products (what? when?)**
- 3. Responsibilities (who? where?)**
- 4. Approach (how?)**
 - 4.1 Monitoring and Control**
 - 4.2 Methods, Tools, and Facilities**
 - 4.3 Configuration Management**
 - 4.4 Quality Management**
- 5. Resources (how much?)**



CMMI Monitoring & Control and CS 577b - I

- 1. Track product and task attributes**
 - Use risk-based Goal-Question-Metric Approach**
- 2. Track project performance**
 - Weekly and major-milestone reviews**
 - Effort reporting; COCOMO updates**
- 3. Monitor critical facilities**
 - As necessary; risk-based**
- 4. Project commitment change procedure**
 - LCA rebaseline; critical Construction rebaselines**
 - Project meetings, email**



CMMI Monitoring & Control and CS 577b - II

5. **Monitor project risks**
 - Top-N risk monitoring risk plan milestone tracking; weekly progress reports
6. **Review progress**
 - Weekly progress report meetings
7. **Conduct milestone reviews**
 - LCA rebaseline(ARB), Core Capability Demo, Transition Readiness Review (ARB), Release Readiness Review
8. **Take corrective action**
 - Revise plans and approaches
 - Negotiate stakeholder commitments
9. **SDP Revision procedure**
 - LCA rebaseline; critical Construction rebaselines
 - Milestone plan updates
 - **Increment plans**



RLCA Package and ARB Guidelines

- **LCA Package Revision Guidelines**
- **RLCA Grading Criteria**
- **RLCA ARB Presentation Guidelines**



LCA Package Revision: Major Sources of Change

- **New team members: LCP responsibilities**
- **New client objectives, constraints, priorities**
 - **OCD and change propagation elsewhere**
- **New alternatives and prototype features**
 - **Possible effects across LCA package**
 - **OCD 5 prototyping updates**
- **Feedback in LCA package grading**
 - **Mostly but not all in SSAD, LCP**
- **Changes to COCOMO cost drivers**



New RLCA Package Component: Change Summaries

- **New Section 1.3 or 1.4 of each LCA package element**
 - **“RLCA Change Summary”**
- **Begin with short summary of element changes and rationale**
- **For all nontrivial changes, complete a simple schema (illustrated by “Example” for Web Mail SSRD)**



New RLCA Package Component: Change Summaries (cont.)

- **Change: “Web Mail IOC changed to pilot operation”**
- **Rationale: “Too risky to begin with full USC service”**
- **Sections Affected Here: “5. Level of Service Requirements; 6. Evolution Requirements”**
- **Sections Affected Elsewhere: “OCD4. Proposed System; LCP2. Milestones and Products”**



RLCA Grading Criteria (80 points)

- 15 -- Change Summaries' clarity, incisiveness
- 50 -- Changes' clarity responsiveness to change sources
- 5 -- COCOMO II run and Data Collection form
- 10 -- Conceptual Integrity

Note: No one-size-fits-all detailed grading criteria



RLCA ARB Presentation Guidelines

- All in SAL 322, February 15-16
- Arrange with client, sign up ASAP
- 10 min: Summary of Change Sources and Resulting Changes
- 10 min: Prototype Change Highlights (as appropriate)
- 45 min: Major Change Description
- 15 min: General Discussions



Outline

- **Overall structure of Life Cycle Plan (LCP) and subsidiary information**
 - **Relations to CMMI Process Areas**
- **Detailed structure of Process Management portion of LCP Approach section**
- **Relation to CMMI Monitoring and Control activities**
- **Example Monitoring and Control approach**

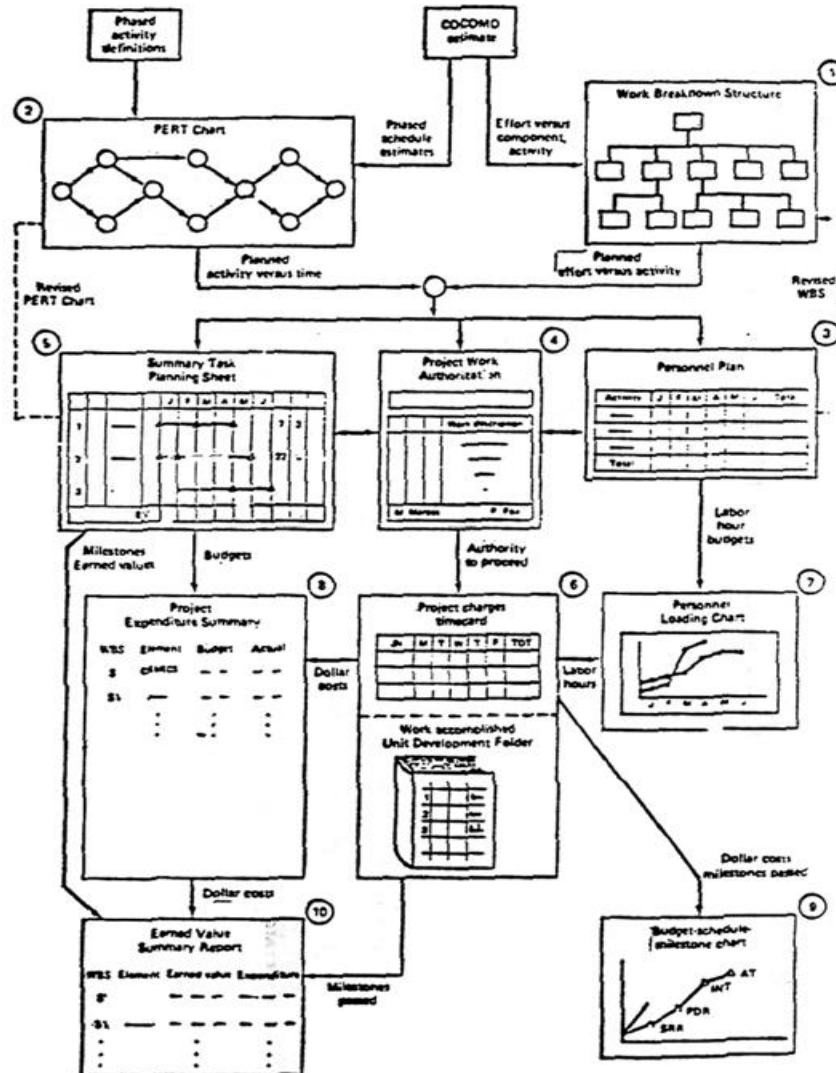


Large Project Monitoring & Control

- **Framework**
- **Relation to Cost Estimation**
- **Unit Development Folders**
- **Earned Value System**



Software Planning and Control Framework





CEMICS Development Cost Estimate

CEMICS Date 2/20/92

Component	EDSI	Product			Computer			Personal attributes				Project			F.FOR													
		AAF	RELY	DATA	CPLR	TIME	SETP	VIRE	TURN	ACAP	AFRT	PCAP	VERP	FTNT	WDEP	FOEN	SCEN	EAR	ARR	NOVA	AME	DEVA	AM	EMSE	EST	ACT	%	E
1. ENVT	10,000		N	1.0	1.86	0.85	N	1.0	1.0	1.0	N	N	N	N	N	N	N	0.83	39	32	312	5.0	160	70	16			
2. UPDATE	6,000																	0.65	23	15	400	6.0	70	15				
3. EQUIP	8,000																	0.65	31	20	400	6.0	120	15				
4. RPTDATA	12,000																	0.84	41	39	308	5.5	124	18				
5. REPORTS	6,000																		25	19	315	5.5	109	18				
6. MISC	6,000																		25	19	315	5.5	106	18				
7.																												
8.																												
9.																												
10.																												
11.	48,000	Total EDSI																Total	144	555	792	16						
12.	186	(MM) _{total}																Schedule	16.5									
13.	258	(EDSI/MM) _{total}																										

Development mode: Organic

CEMICS Project PERT Chart

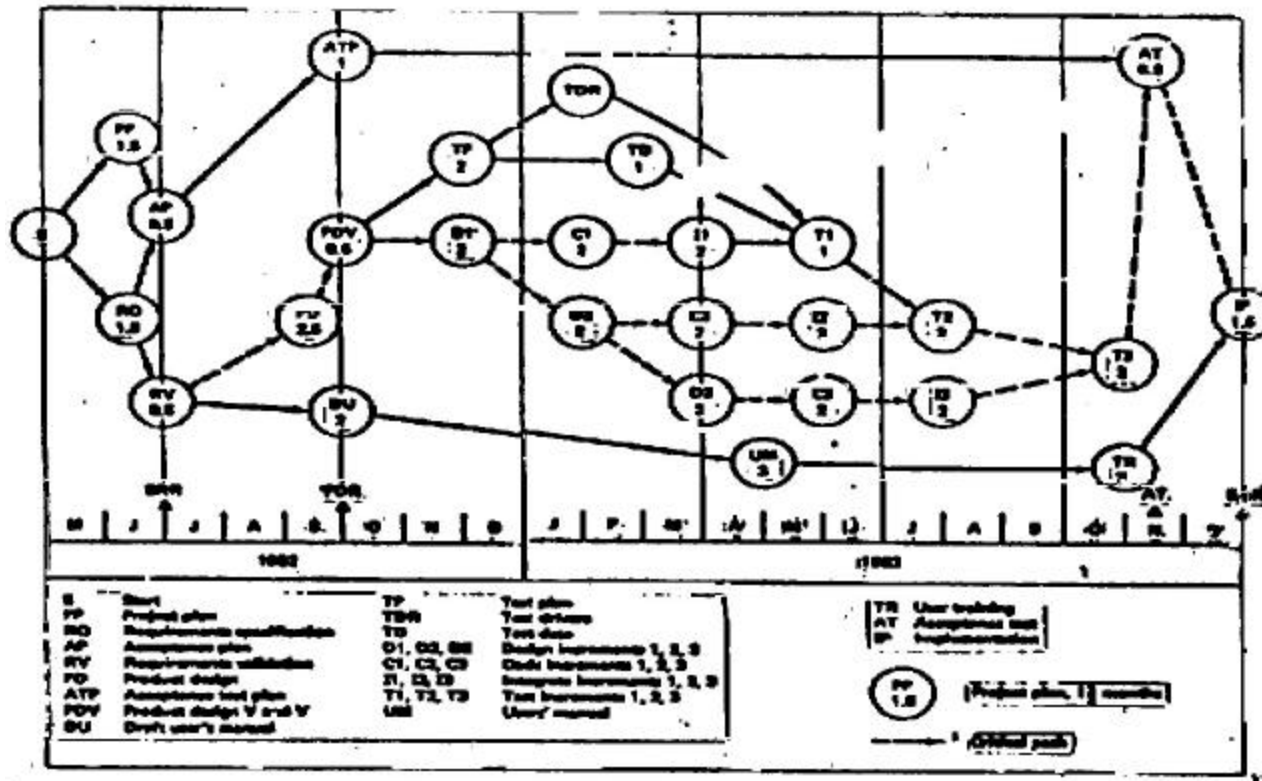


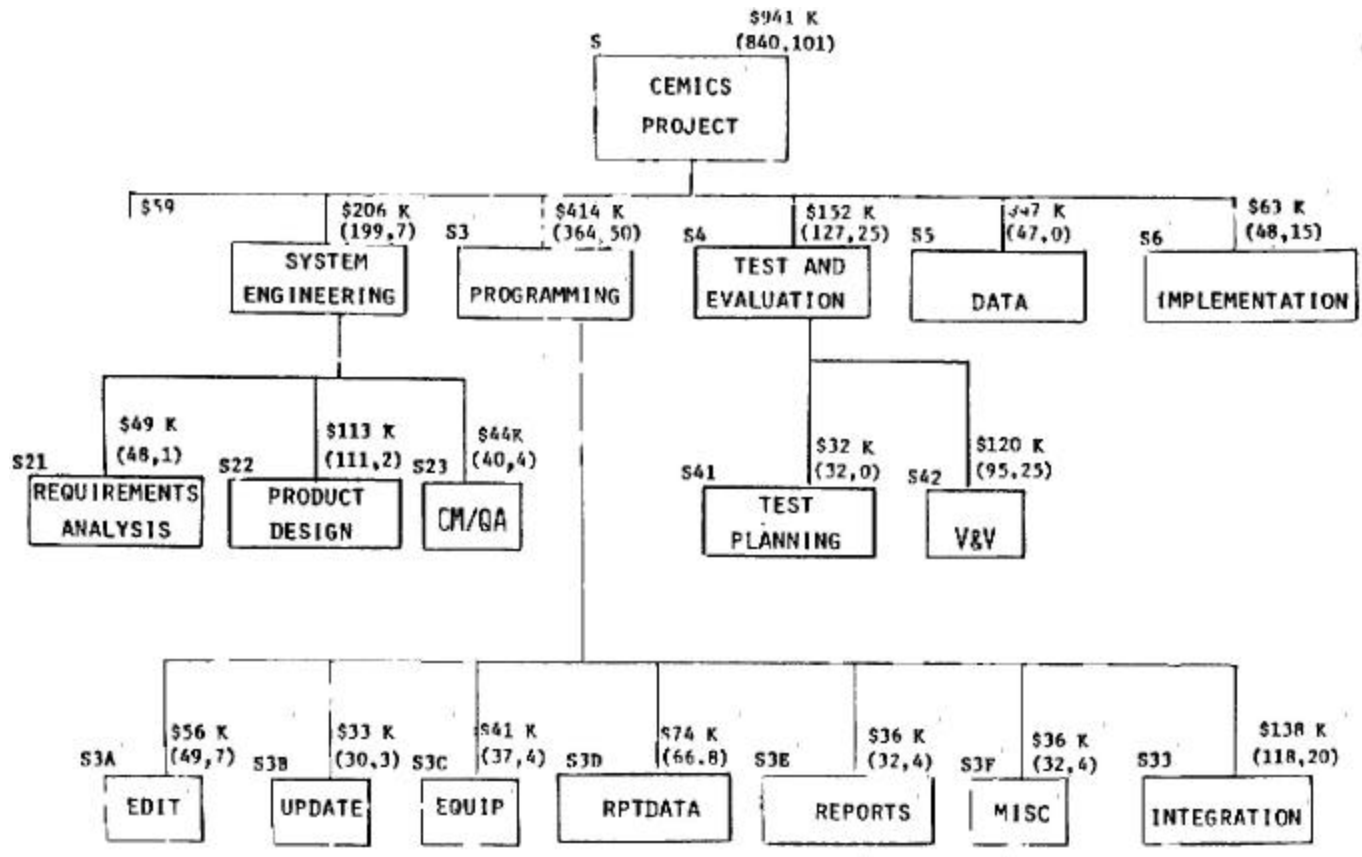
FIGURE 22-18 CEMICS Project PERT Chart



Activity	Percent of Effort (from Table 7-3)	Budget
Requirements analysis	6%	\$ 48K
Product design	14	111
Programming	46	364
Test planning	4	32
V + V	12	95
Project office	7	55
CM/QA	5	39
Manuals	6	48
Total	100%	\$792K



CEMICS Initial Work Breakdown Structure (WBS)





CEMICS Phase and Activity Distribution

Phase		Plans and Requirements	Product Design	Programming	Integration and Test
Quantity					
Effort	%	6	16	61.5	22.5
	MM <i>144</i>	9	23	89	32
Schedule	%	12	19	54.3	26.7
	Mo <i>16.5</i>	2	3	9	4.5
FSP = $\frac{MM}{Mo}$		4.5	7.7	9.9	7.1

Activity	Phase		%	FSP	%	FSP	%	FSP
	%	FSP						
Requirements analysis	46	2.1	15	1.1	5	0.5	3	0.2
Product design	20	0.9	40	3.1	10	1.0	6	0.4
Programming	3	0.1	14	1.1	58	5.7	34	2.4
Test planning	3	0.1	5	0.4	4	0.4	2	0.2
Verification and validation	6	0.3	6	0.5	6	0.6	34	2.4
Project office	15	0.7	11	0.8	6	0.6	7	0.5
CM/QA	2	0.1	2	0.2	6	0.6	7	0.5
Manuals	5	0.2	7	0.5	5	0.5	7	0.5



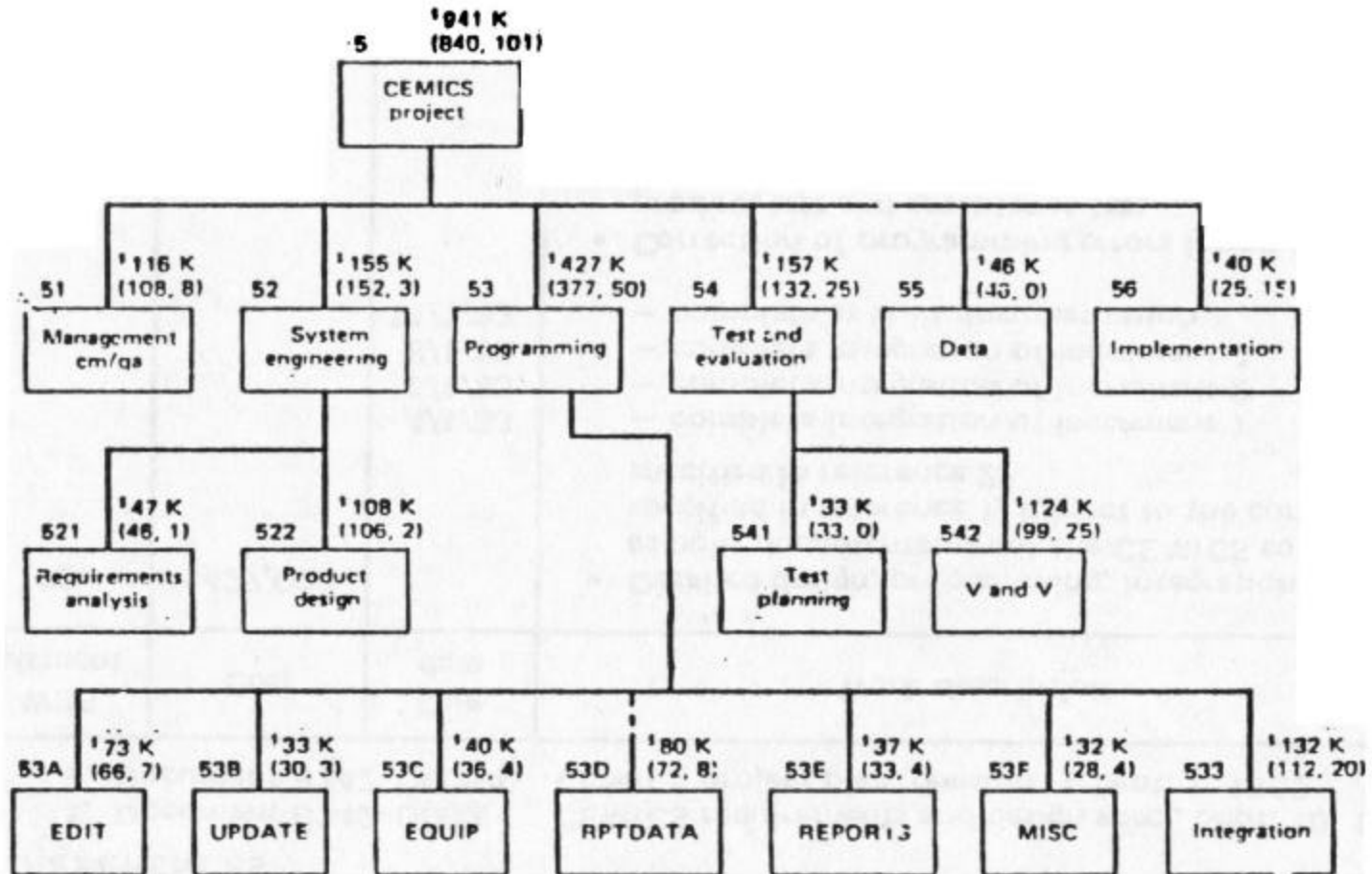
CEMICS Personnel Plan

Milestones		Δ SRR	Δ PDR	Δ I1	Δ I2	Δ I3	Δ PT	Δ AT	Δ IP													
WBS Element	Activity	1982							1983							Total						
		M	J	J	A	S	O	N	D	J	F	M	A	M	J		J	A	S	O	N	D
51,523	Project management, CM/QA*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
52,55,	System engineering	2.5	3.5	4	5	5	3	3	2.5	2	1	1	1	1	2	2	1	1	1	.5		42
563																						
53	Programming				5	1	2	4	4.5	5	5.5	8	7.5	7.5	7	4.5	4	3	2	1.5	1	68.5
53A	EDIT								1	1	1	1	2	2	2	1	.5	.5				12
53B	UPDATE								1	1	1	.5	.5	.5	.5	.5						5.5
53C	EQUIP								1	1	1	1	1	.5	.5	.5						6.5
53D	RPTDATA								.5	1	1	1	2	2	2	2	1	.5				13
53E	REPORTS								.5	.5	.5	.5	1	1	.5	.5	.5	.5				6
53F	MISC									.5	.5	.5	.5	1	1	.5	.5					5
533	Integration									1	1	1	1	1.5	2	2						9.5
54	Verification and validation	.5	.5	.5	1	1	1	.5	.5	.5	.5	.5	1	1	1	2	2	3	3	3	1.5	24
56	Implementation																			1.5	3	4.5
5	Total	4	5	6	8	9	9	9	9	9	10.5	10.5	10.5	10	9.5	9	8	7	6.5	5.5	4	159
	Computer cost (\$k)		1	1	1	1	2	2	3	4	5	6	7	7	7	8	9	9	9	9	10	101

NOTES: * CM/QA administrative functions to be handled by Project Manager's secretary
 † Training activities performed as part of system engineering



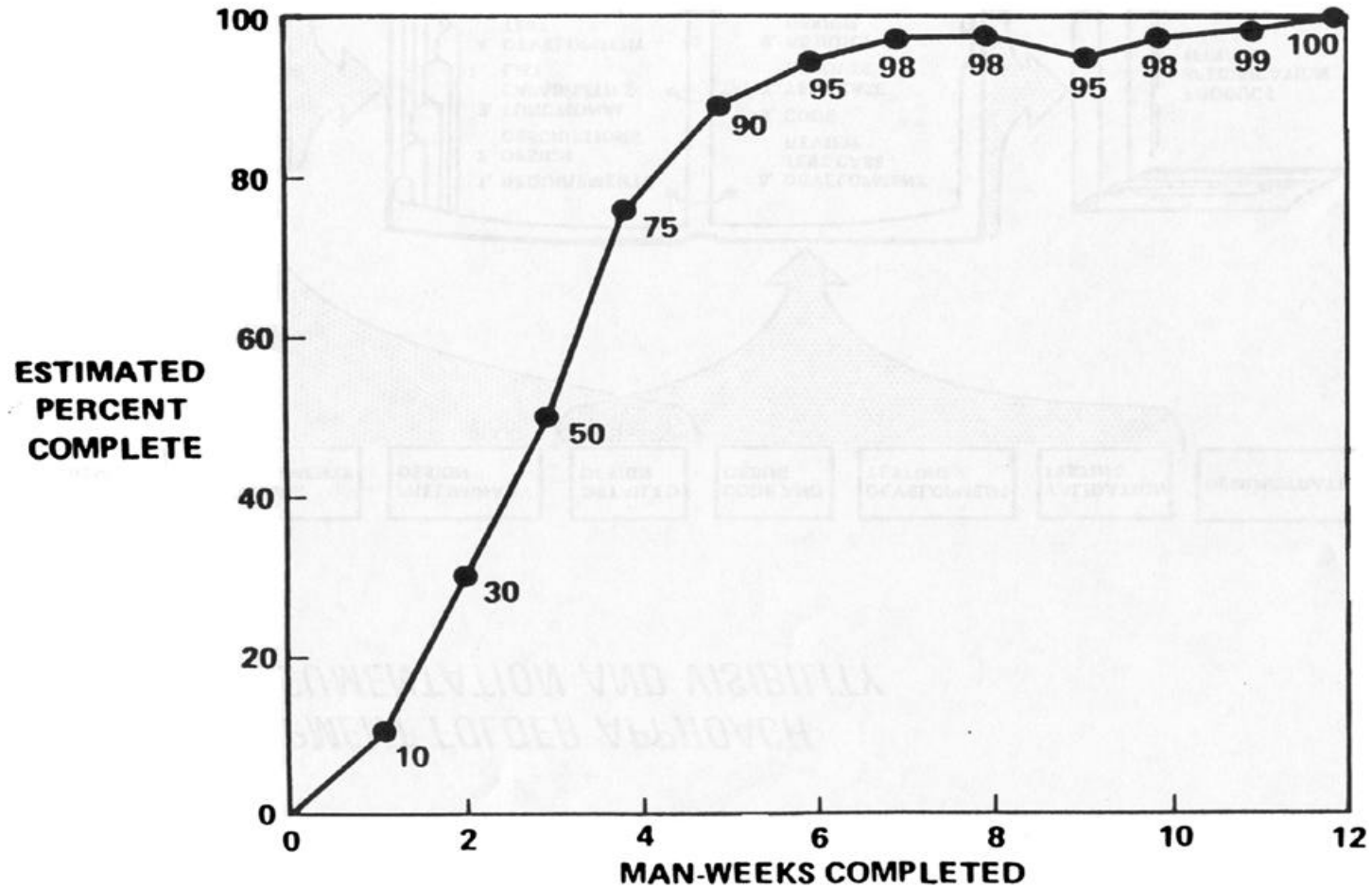
CEMICS Revised WBS



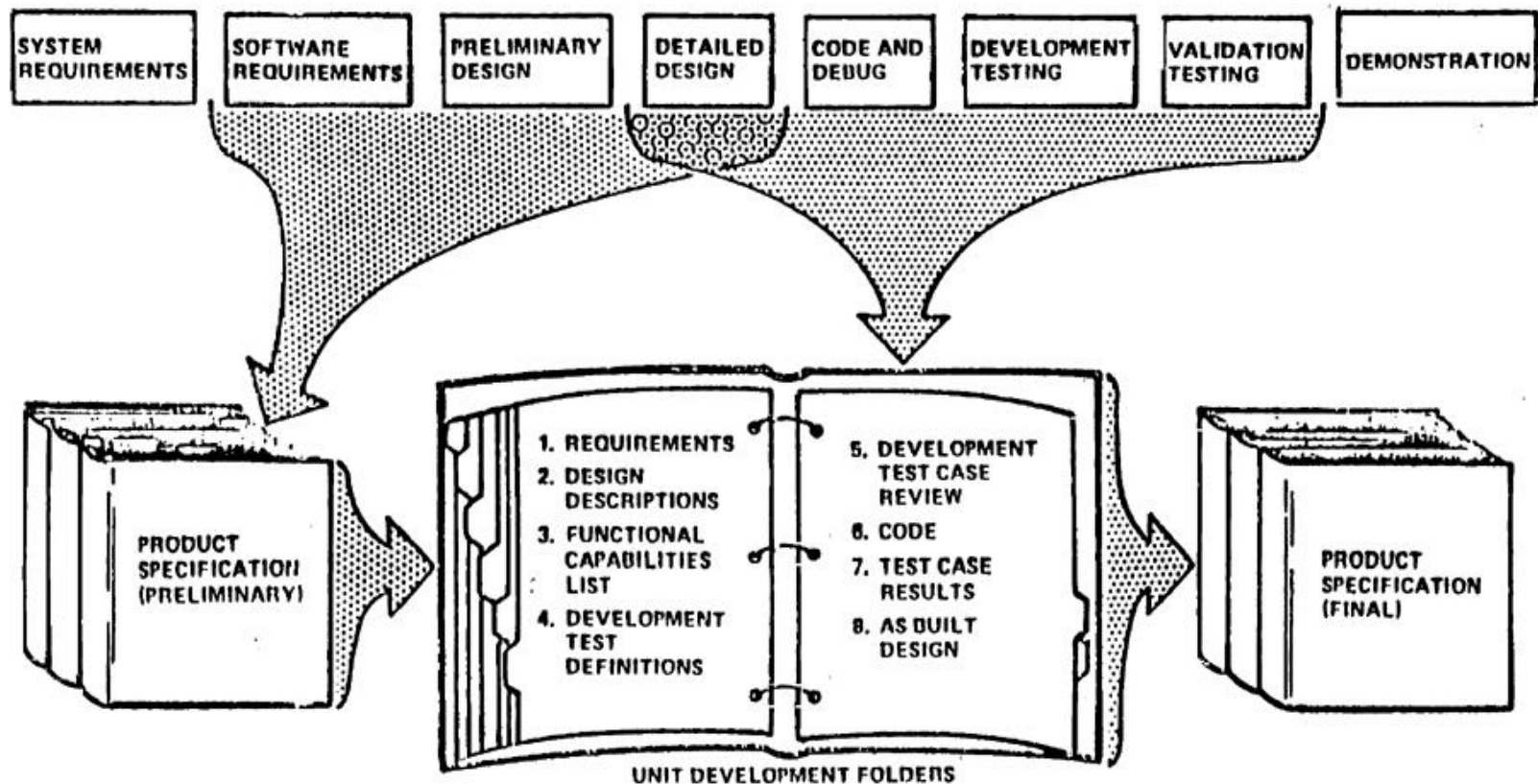


PROJECT TITLE CEMICS		PROJ. NO. B142	PWA ORIGINATOR J. P. Jones	ORIG. DATE 9/15/82
PWA TITLE CEMICS programming		PWA NO. B142-022	TOTAL COST \$427,000	LABOR COST \$377,000
REFERENCES 1. Document B142-D002. CEMICS requirements and design spec., Sept. 10, 1982. 2. Document B142-D005A. CEMICS project plan, revision A, Sept. 1, 1982				
WBS element	Cost	Due date	Work description	
53	\$427,000	4/1/83 6/1/83 8/1/83 11/1/83	<ul style="list-style-type: none"> • Detailed design, programming, integration, and as-built documentation of the CEMICS software specified in reference 1, subject to the conditions specified in reference 2. <ul style="list-style-type: none"> - complete integration of increment 1 - complete integration of increment 2 - complete integration of increment 3 - complete as-built documentation • Correction of programming errors found in product test and acceptance test 	
REVISION NO., DATE		MAJOR CHANGES		
AUTHORIZED BY Maria Marcos		ORG MSD	DATE 9/22/82	ACCEPTED BY Fred Fox
		ORG BSD	DATE 9/27/82	

Sample Software Module Development Estimate



Unit Development Folder Approach Ensures Documentation and Visibility





UNIT DEVELOPMENT FOLDER COVER SHEET					
PROJECT: <u>CEMICS</u>					
UNIT: Edit (iner, 1)			CUSTODIAN: W.P. Jones		
ROUTINES INCLUDED: <u>EDIN, EDSCAN, EDTAS, EDADD, EDEL, EDMOD, EDERR</u>					
Section	Description	Due date	Date complete	Originator	Reviewer
1	Unit requirements	10/1/82	10/1/82	W.P. Jones W.P.S.	R.E. Lee REL
2	2a. Prelim	10/1/82	10/1/82	W.P.S.	REL
	2b. Code-to	11/1/82	10/29/82	W.P.S.	REL 11/1
	2c. As-built	4/1/83			
3	Test plan	11/15/82	11/18/82	W.P.S.	REL 11/19
4	Unit code	12/1/82	11/29/82	W.P.S.	REL 12/2
5	Test results	1/1/83			
6	Problem reports				
7	Notes				
8	Reviewers' comments				



Earned Value System

- Assign earned value to each project task

(EV) Test Plan = \$32K (Test Plan Budget)

- Accumulate project EV as tasks completed

- Completing Test Plan may cost \$25K or \$50K, but EV is simply \$32K

- Compare project EV to expenditures

- Overall progress assessment
- Trouble-spot identification



Earned Value Summary Report

PROJECT: CFMICS

PROJECT NUMBER: 0142

DATE: 1/1/83

BUDGET: 1041.00

FROM: 7/1/82 TO 12/31/83

MANAGER: M. BROWN

WBS Number	Job Number	WBS Element	EV Type	In Date 'K						Percent of total EV				
				EV	Actual	A - E	E	E20	EV	Actual	Diff.	E10		
S		CFMICS		512	618	269.0	2724	1		941.0	29	29	0	
S1	B14201	Management	LM	02	02	38.5	371	4		110.0	33	32	1	
S2		System eng.		06	06	107.7	817	15		155.0	00	59	-10	*
S21	B14202	Requirements	LM	25	25	37.4	241	-26		47.0	69	51	-18	*
S27	B14203	Product design	LM	71	71	75.3	870	10		108.0	70	83	-7	
S3		Programming		280	340	88.0	827	4		427.0	21	22	1	
S3A	B14204	EDIT	MS	60	48	9.0	131	46	..	73.0	12	18	6	
S3B	B14205	UPDATE	MS	60	57	19.0	167	-15		33.0	58	19	-9	
S3C	B14206	EQUIP	MS	80	71	16.0	203	35	*	40.0	38	51	13	
S3D	B14207	RP'DATA	MS	80	80	16.0	122	-24	*	80.0	20	15	-5	
S3E	B14208	Reports	MS	30	40	12.0	100	-12	*	37.0	32	29	-3	
S3F	B14209	MISC	MS	20	58	7.0	58	100	...	37.0	8	18	12	
S33	B14210	Integration	MS	00	00	19.0	136	-20	*	132.0	14	10	-4	
S4		test		60	80	19.0	37.0	85	...	157.0	12	24	12	
S41	B14211	Test plan	MS	60	86	10.0	28.7	187	...	33.0	30	80	60	...
S42	B14212	V&V	MS	00	00	9.0	7.3	-18	*	124.0	7	6	-1	
S5	B14213	Documentation	LM	2.4	2.4	14.8	13.8	-8		40.0	32	30	-2	
S6	B14214	Implementation	LM	00	00	0.0	0.0	-		40.0	0	0	0	



Earned Value Summary Report - Results

- **Major trouble spot - Test Plan**
 - Test drivers too elaborate
 - Overcharging
- **Early visibility enabled timely fix**
 - Small overrun in Test Plan
 - Balanced by requirements analysis underrun



Session 2 - Summary

- **Good planning and control requires**
 - Framework of techniques
 - Much up-front work on plans
 - Commitment to control
- **Good P&C can produce self-fulfilling estimates**
- **Project plans are living entities**
- **P&C techniques aren't personnel evaluation devices**
- **P&C techniques aren't necessarily routinizing**